THE

MECHANICS' MAGAZINE,

MUSEUM,

Register, Journal,

AND

GAZETTE,

JANUARY 1st.—JUNE 25th, 1842.

VOL. XXXVI.

"To distinguish and present, as it were, in several columns, what is extant and already found, and what is defective and farther to be provided."

BACON.

LONDON:
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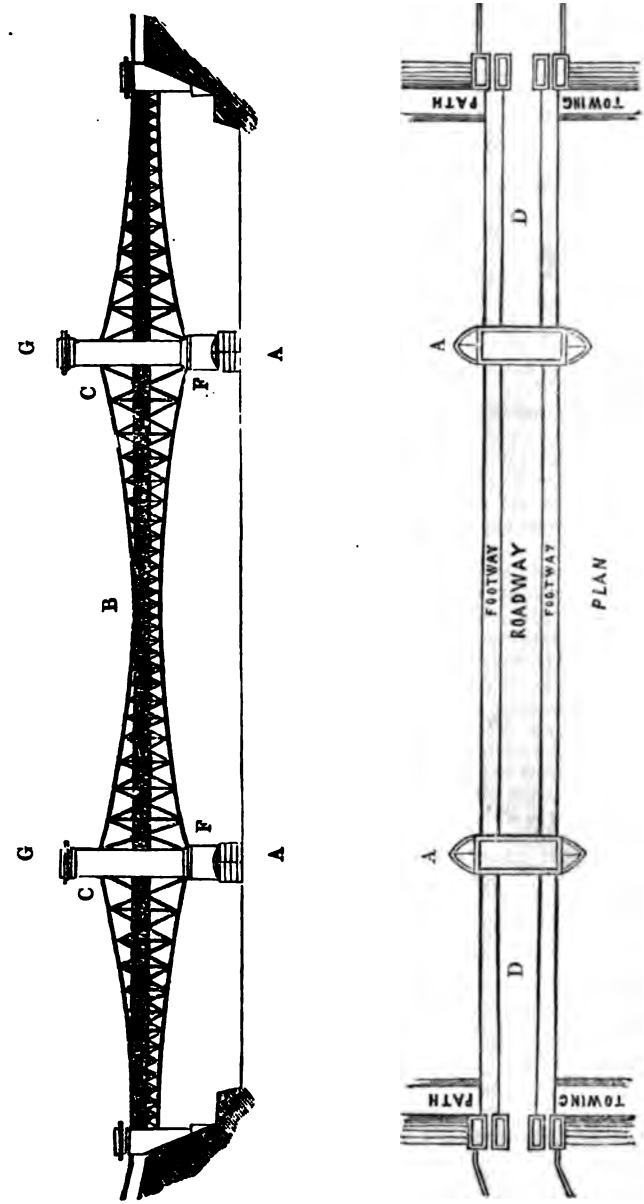
GIBBS'S IMPROVED SYSTEM OF BRIDGE BUILDING.



MR. GIBBS'S IMPROVED SYSTEM OF BRIDGE BUILDING.

We have already given a brief notice (No. 958, p. 490) of this system of bridge building, in our abstract of Mr. Gibbs's specification of certain patented improvements in roads, railways, &c., among which that system is included; but justice to the skill and ingenuity by which it is distinguished, and the many important advantages which it offers, requires that we should lay a more detailed and fuller account of it before our readers.

The master feature of this system is, that it combines in one, the best properties both of the common arc bridge, and the suspension bridge, without the worst of their respective drawbacks—the solidity and strength of the former without its abutments, and the lightness of the latter without its land ties. If there be no fallacy in the principles of construction followed by Mr. Gibbs—and for ourselves we do not see any—it should follow, that if care be taken in adjusting the weight of the materials employed, a bridge built on this system will be so perfectly equilibrated, as to rest perpendicularly on its piers *without any out-thrust whatever*.

The engravings on our front page exhibits an elevation and plan of an entire bridge constructed on this plan. The following description of the details we extract from Mr. Gibbs's specification.

"A A are the piers; B B the arches, which may be made of hollow iron tubes or of solid timber; C C are the suspending or main chains, or inverted arch; D D is the roadway, which may be fixed to the suspending rods; E E, rods which connect the two arches together; F F are what I call thrusting braces, which commence at the lower part of each pier, and are united to the first series of suspending rods at the junction of the inverted arch C C. Another series of braces G G, called the suspending braces, commence at the top of each pier at the place where the arches C C, on each side of the pier are connected together. These braces are connected with the suspending rods E E, at their junction with the lower arch B B. After the first set of portions of the arches are combined together, a second set can be added, precisely on the same principle as before described, each end of the bridge terminating with a half arch, and counterbalanced and resting upon the piers H H. It will be obvious, however, *that the succeeding portions of* the arches as they recede from the pier will have to sustain less weight than those nearer to the pier, and may accordingly be made lighter, commensurately with the load they will have to sustain. As many of these arches as may be required to form the width of the bridge, may be connected together by suitable horizontal and diagonal rods and braces. In some cases it may be of advantage to run the two arches through each other, which will permit a greater curvature to be given to the arches.

"The proportions of the different parts of the weights and nature of the materials to be used, and the mode of combinating them together at the joints will vary according to the character of the structure, and must be left to the judgment and skill of the engineer employed in each case."

PRACTICAL SUGGESTIONS FOR THE PROTECTION OF MANUFACTORIES FROM FIRE.

Sir,—Although I am very reluctant to obtrude my opinions on public notice, yet feeling most strongly the importance of the subject, and possessing the means, from *experience*, of affording information that may prove beneficial, I will hesitate no longer to offer, through the medium of your valuable columns, an explanation of the means I have long since adopted, with great advantage, to secure my premises and property from the calamity of fire. The frequent and awful conflagrations which have lately taken place, to the great injury both of public and private property, render it extremely desirable that some means should be taken to prevent a recurrence of them, if possible; and as the precautions about to be suggested have been attended with most beneficial results in my own establishment, I deem it proper to make them generally known, as I feel persuaded that many or most of the recent fires might have been arrested, if similar care had been taken.

I am the proprietor of an establishment where a number of workmen are employed amongst timber, shavings, linen, tow, oils, and where various articles of a combustible nature are used. To prevent an accident by fire, I have established several precautions. One of these is, that under each work-bench,

throughout the premises, stands a pail of water, merely covered over with a loose wooden cover. Any workman whose bench is deficient of this at any time is liable to fine or censure; in fact, the order is peremptory, and is always obeyed (I think the plan should be adopted in Her Majesty's dock-yards.) On one occasion my premises were saved by this means. A large bag of tow caught fire, from a candle being placed too near it, in the presence of four persons, two of whom were paralyzed with fear; the others caught up their pails of water, and subdued it in a minute. Had this not effected the object, there is a fire-pump in the yard, which would have been in action in three minutes more; for it is so constructed, that by merely screwing on a hose, or various lengths of hose, one person can pump, and another direct the hose. I consider this description of pump to be one of the most useful and desirable appendages to a large manufactory, nobleman's mansion, or public building, that can be imagined. All buildings require a pump of some kind; and wherever there is an opportunity of placing a pump *outside* the house or building, it should be of this construction. I have had my pump eleven years. The care generally taken has made it unnecessary to have recourse to it, except for common purposes, on my own premises; but the house of an eminent grocer, who lives within thirty yards of my premises, having caught fire in the basement story, where his carpenter, who had just left work, had been making packing-cases, my watchman, who is on duty every night, screwed on the hose, and breaking up the area grating, introduced it within less than five minutes after the alarm was given. In about ten minutes more, and before any other assistance arrived, the fire was so much subdued as to do very little damage, (40*l.* covered the loss;) whereas the house being in a very populous neighbourhood, abounding in old buildings, there is no knowing to what extent the mischief might have gone, had the fire not been stopped. Another precautionary measure I take is this: I have six strong bags made of common Russia sheeting, 1¼ yard long, ¾ of a yard wide, with a strong tape run through the mouth of each, my name and address being stained outside. These bags are laid on a shelf in my counting-house, with strict injunctions that they are never to be used for any other purpose whatsoever, except that for which they are intended, namely, that in case of fire on my own or adjoining premises, the account-books and papers, or small articles, shall be instantly thrown into them, and removed to a place of safety in the neighbourhood. It is impossible to express the satisfaction you feel on having taken a precaution like this; but what it is *I know* from actual experience. A very alarming fire took place next door to my premises, to the destruction of four houses. I was absent sixty miles from London at the time; and on a certain morning, at ten o'clock, was surprised by the appearance of my coachman, who had rode down express to inform me of what had occurred; or, rather, to say that "a great fire was raging when he left, and it was feared my premises could not be saved." My first inquiry was, if my resident clerk was on the premises? The messenger replied, "Yes; and several of the men." My mind was then immediately set at rest, because I knew all the books and papers would be safe; and as the *stock and premises were insured*, no very serious loss could take place. I was thus enabled to return in quiet mind to London; where I found, as I expected, the books and papers all taken to my residence, in the neighbourhood, and not much damage done to the premises, though the adjoining four houses were burnt to the ground. At this time the fire-pump was not erected, or the whole might have been easily saved: of this there is no doubt whatever. To solicitors, merchants, public companies, and, in short, every person possessing papers of consequence, this precaution, the cost of which will not exceed 20*s.*, is invaluable.

Your inestimably useful publication, to which I have had the pleasure of subscribing for many years, appears to me the proper medium of disseminating a knowledge of these facts; and if you do not think the article too long for publication, the insertion will be esteemed a favour by, Sir,

Your humble servant,

A MANUFACTURER.

P.S.—The late Mr. Russel, of St. John's-street, Clerkenwell, made my pump, in 1830; but since his death, I

have permitted my neighbours, Messrs. Bailey, of 271, High Holborn, to take patterns from it, and authorized them to exhibit mine when required. The general efficacy of the thing consists in the ready, nay almost immediate application, in case of a fire, the hose being always at hand to screw on in a minute.

ON THE COMBUSTION OF COAL AND COKE IN FURNACES.—CARBONIC OXIDE.—BY C. W. WILLIAMS, ESQ.

Sir,—The facts communicated in the enclosed extracts from a letter which I have just received from New York, and from a gentleman who is a stranger to me, are so satisfactory, and involve so important a feature in effecting perfect combustion of the fuel in air-furnaces, that I hasten to give it the benefit of your extended circulation, and of pointing out its connexion with the subject on which I have lately addressed you.

In my "Treatise on the Combustion of Coal," I have dwelt on the loss occasioned by the escape of a large quantity of the carbon of the coals, in the form of a gas, called *carbonic oxide*. I have shown that this gas, which is a combustible, is formed from the carbonic *acid*, which is an incombustible: that it therefore requires its due portion of atmospheric oxygen; and that this portion is precisely the same as was originally required for the carbon, in the carbonic acid previously produced in the furnace. I showed that, because this was an *invisible* gas, we were in the habit, in practice, of neglecting its effect, and providing it with the due quantity of air; and that because its imperfect combustion was not *visible* in the form of *black* smoke, its very existence was even denied by many practical men. In the following communication, however, this question is set at rest; as we find this very neglected gas, carbonic *oxide*, actually collected, and made the instrument of very extensive purposes, and producing intense heat. Here is no theory, but the best practice, namely, that on a large scale. The letter is as follows:—

"New York, November 25, 1841.

"*Sir,—I have* not the honour of being *personally acquainted with* you, yet I feel *myself entitled to the liberty* which I take in *addressing you, were it only to* express to you my sense of obligation which the perusal of your most valuable book, "On the Combustion of Coal," has laid me under.

"My object in writing to you now is, to draw your attention to the fact, that the result of your admirable and thorough inquiry into the theory of combustion has, for some time past, been in most successful operation on the continent of Europe; and that, in fact, its application to practice, in the manufacture of iron, has already been productive of an immense economy of fuel, and most valuable improvements in that important branch of industry.

"Mr. Faber, director of the royal mines at Wasseralfingen, in the kingdom of Wirtemberg, has for some years been engaged in a series of experiments upon the combustion of the large quantities of *carbonic oxide* gas, which is generated in blast-furnaces, and which generally escapes unconsumed out of the mouth of the furnace, where it may be seen burning with a blue flame. He has now succeeded in *collecting* this gas, and *conveying* it in a pure and uninflamed state to other furnaces or ovens requiring to be heated; and there, by a proper admixture of atmospheric air, its complete combustion, (or conversion into carbonic *acid* gas,) is effected, and consequently an intense temperature is produced in the furnace.

"The *mode of mixing* the gas, and the whole process of combustion, as practised by Mr. Faber in his furnaces, is in beautiful harmony with the theory which you have so conclusively established; and it is truly interesting to observe the exact coincidence of your scientific investigation with the actual results of a long course of practical experiments made on a large scale by M. de Faber.

"According to Mr. Faber's method, the air is forced into the furnace, which is to be heated by the carbonic oxide gas, through a *series of blow-pipes*, after having been previously heated in the furnace itself to a high temperature. To afford the air and gas sufficient time for an internal mixture and incorporation, before they are burned in the main chamber of the furnace, the fire-bridge is made very long, thus complying with all the conditions necessary to a complete combustion; which is, in fact, effected in the main chamber of the furnace. This being the case, there is of course *no smoke*, and consequently *no chimneys are required* in the furnaces employed by Mr. Faber.

"In furnaces of that construction, Mr. Faber employs the otherwise lost carbonic *oxide* gas, for the purposes of refining, puddling, reheating, and forging the iron; and to various other operations, requiring a high temperature, with the most perfect success: so that nearly all the large iron

establishments in Germany, and many in France and Belgium, are adopting the invention of Mr. Faber. This invention has been secured by patents in all those countries; also in England. It has also been applied to steam-boilers, for the purpose of burning the gases that are generated in boiler furnaces, and escape unconsumed with smoke out of the chimney.

"I am very desirous of knowing how your patent furnace is operating in practice. I should take it as a great favour if you would communicate to me some information on the subject, as I take the liveliest interest in its success.

"I remain, Sir, with the highest respect,
"Your obedient servant,
"C. DETMOLD, C. E."

"To C. W. Williams, Esq.,
"Liverpool."

The facts communicated in the foregoing letter are of the last importance to the entire manufacturing interests in this country, and I feel much indebted to Mr. Detmold for his valuable statement. It will, I trust, satisfy (or silence) those who have so pertinaciously denied the statements made by me, (and for which I adduced the highest chemical authority,) as to the existence of this gas, (carbonic *oxide*,) and the necessity of providing the due supply of atmospheric air for its combustion; and this *behind* the bridge, in order to prevent its escape unconsumed. For insisting on the value of a supply of air, in this way, I have been charged with the "grossest ignorance;" and the necessary effect of the air so supplied is alleged to be, the destruction of the boilers, by the *cooling* effect it produces. Strange to say, that such absurdities are actually believed and acted on, at a time when not only chemistry, but common sense and practical observation, should have rejected the idea, as unworthy a moment's consideration.

It is asserted, and the alleged fact published, that, because I do not, by some regulating and closing valve, absolutely *prevent* the admission of any air behind the bridge, where the carburetted hydrogen gases are all evolved, and the fire is clear and a bright red, and the solid fuel on the bars highly ignited, such air has the effect of *cooling* and *contracting* the plates of boilers; and that this contraction will go on to such an extent, that *the rivets will be dragged successively, (by this curious contracting* and expanding process,) in opposite directions, until they become loosened in the rivet-holes, and the boiler becomes leaky.

Now, Sir, the whole of this ingenious crudity is utterly at variance with fact; for at the very moment when the fire is in this clear red hot state, and the fuel on the bars highly ignited; and when it is alleged there is *no gas to be consumed, or to require a supply of air*, at that very moment the largest quantity of carbonic oxide gas is generated, and a large supply of air required for its combustion; thus *increasing* the heat, rather than producing a *cold* effect, and preventing this same gas escaping by the chimney unconsumed, or of being consumed at the top, as we frequently see from the tops of our steam-packet funnels.

That such silly and unfounded theories as above alluded to should be uttered or credited in our day is very discouraging to those who wish, by the application of science to practice, to enlighten our practical mechanics, and improve our systems.

The subject, thus strikingly brought forward by Mr. Faber's letter, is so important, and its connexion with our every-day practice, in the management of ordinary boiler furnaces, so direct, that I propose returning to it in your next number.

I am, &c.,
C. W. WILLIAMS.

Liverpool, December 28, 1841.

THE MODERN MECHANICAL MOLOCH.

The railway system has been productive of another appalling accident—the most deplorable, by far, which has yet stained its chequered annals. Eight persons in an instant dashed to atoms, and twice as many grievously wounded! How many more such instances of horrid carnage must we wait for, before the legislature shall think it time to interfere for the protection of outraged humanity? It is idle to talk any longer of the dependence to be placed on the spontaneous exertions of the Railway Companies—of their interest in safety of conveyance being identical with that of the public—and so forth. The country has had several years of this dependence, and what has been the result? One long, continuous,

endless train of disastrous accidents, nine-tenths of which might have been averted by the exercise of due care and prudence on the part of these very companies, who would still have us place all our trust in them! Deodand after deodand has been imposed by honest and indignant juries —deodands surpassing in amount any previously known to our criminal history —denunciation on denunciation has been fulminated from the press—and yet the companies have adhered as doggedly to their life-and-limb-destroying practices as ever. Not one improvement, of any material consequence, have they ever originated or adopted, in obedience to the public voice. Nay, so dead to shame are they, that, when heaped with obloquy, to a height which would have crushed any ordinary body of public-disregarding monopolists, they had actually the assurance to protest, by their representatives, at a late Public Conference, that, so far as depended on them, (the Directors, Managers, and other chief executive officers,) there was no room for improvement whatever!

Be it ever remembered—it is for the honour of the railway system itself that it should be remembered—that the greater number of all the accidents in question are traceable to circumstances which have no *necessary* connexion with the system. The same mechanical ingenuity and skill which have given us, in the modern railway, a swifter means of transit than the world ever before possessed, could also, if allowed fair play, have rendered it as safe as it is swift; but owing to something or other faulty in the construction of these companies that fair play they have not had—they have been superciliously repulsed, where they ought to have experienced every possible encouragement—rudely denied the opportunity of perfecting that which they originated. Scarcely a single accident can be pointed out, which would not, by the adoption of some plan proffered to, but slighted or rejected by, the companies, have been most certainly prevented. And for these reasons it is, that we invoke the paternal interference of the legislature, and deprecate any further exclusive reliance on the companies.

The case which has now immediately called forth these observations furnishes *ample confirmation of their* truth. Early *on the morning of the day* preceding Christmas, one of the trains on the Great Western Railway, consisting of "an engine and tender, two (third class) passenger trucks *placed next to the tender*, a truck for passenger's luggage, and 16 luggage waggons" (*Evidence of Hudson, the guard*) "ran into some loose earth which had slipped from the side of the (Sonning) cutting on to the rails" (*Evidence of Reynolds, the driver.*) "The carriages by the sudden stoppage came upon each other with such a concussion, that the passengers were thrown out in all directions among the carriages."—(*Hudson.*) Eight were killed and 17 more or less wounded. The luggage trucks which were in the rear do not appear to have been at all damaged. Now the danger of this practice of placing the passenger trucks next to the tender and carriages,—a practice common to other companies as well as the Great Western—had been times without number pressed on the attention of the railway companies, and was in fact a subject of universal complaint. Several accidents had occurred from it, and one of a very fatal nature not long ago on the Brighton. Indeed, just before the starting of the very luggage train which met with the disastrous accident now in question, the propriety of placing the passengers next the engine and tender appears to have been a matter fully discussed between the three principal officers of the Great Western Railway, the Engineer, Secretary, and Superintendant. "The passenger truck," says Mr. Brunel, "was put *in the middle of the train*," (a point, however, in which Mr. Brunel is flatly contradicted by Hudson, the guard, and is most assuredly in error,) "by my order, *merely as a concession to opinion which I knew had been frequently expressed.* On the evening in question I discussed the matter with the Superintendant, and Mr. Saunders, at Paddington. I thought it would have been better not to have sent down any luggage train that night; but there were so many applications for places, that *we thought it better to place the passenger truck in the middle, lest it should be considered a mere act of obstinacy if we adhered to the former practice.*" How it came to pass after the decision thus come to, or pretended to be come to, that the passenger trucks (for there were two of them,)

were not placed in the middle of the train, but in their old place of imminent danger next to the engine and tender, does not appear; but when we consider that Mr. Brunel tells us at the same time, that his own "decided opinion is, that near the engine is preferable to behind the goods trucks," and that Mr. Saunders, the Secretary, adds, that "if the control remained in his hands, he should undoubtedly,"—notwithstanding all that has occurred—the public opinion notwithstanding—and the tragical event by which the soundness of that opinion has been just illustrated notwithstanding—"*adhere to the practice of placing the passengers' trucks in luggage trains in front*" (!!!)—it may not be difficult to guess pretty correctly where the blame lies. He is a dull officer who cannot distinguish between an order given in earnestness and sincerity, and one given only to be disobeyed. Let the understanding, however, of the parties concerned in the present case, be as it may, these facts are certain: *first*, that the accident from which such fatal consequences have arisen, was caused by adherence to a practice long denounced as imminently dangerous by all the rest of the world, save certain of the railway authorities themselves (the value of whose reasons it is under the circumstances needless to discuss); *secondly*, that had the unfortunate passengers been only placed where the goods were, they might all at this moment have been alive and well; and, *thirdly*, that there are parties of note and influence among railway managers, who, if they could still have all their own way ("if the control remained in their hands") would listen neither to the exhortations of wisdom and humanity, nor even to the bitterer lessons of experience.

But this is not all. There are authorities of great eminence and weight in the scientific world, who consider that it is by no means sufficient for the safety of railway passengers, that they should be placed at a distance from the engine and tender, with luggage or other carriages between, and who have strenuously urged that all carriages conveying passengers, should be preceded by a separate carriage, "carrying a buffer of sufficient power to save the whole train," and that every carriage, whether *carrying passengers or goods, should be provided* with *separate buffers, to assist* in diminishing the shock from concussions. Sir George Cayley, Bart., has furnished the plan of an air buffer of the former description, which he calculates would have a power of retardation, without the least risk of breakage or upsetting, of 39 tons, and which might have its power increased to any requisite extent. (*Essay on the Prevention of Railway Accidents.*) He supposes the case of two heavy trains, provided with such buffers, meeting each other on the same line of rails at full speed, and shows that "if the elasticity of the buffers be supposed perfect, each train would rebound with the same velocity it advanced." Dr. Mallet, of Dublin, following in the same track, has invented a hydro-pneumatic buffing apparatus, of great ingenuity and efficiency, in describing which, he lays it down as an indisputable principle, that until railway passengers sit in carriages either protected by a general buffing apparatus placed in advance, or each of them so constructed, that in the event of a collision "they shall not only ease the blow to the utmost, but be competent to bear the residual shock, railway travelling *must be always liable to frightful accidents.*" (*Mech. Mag.*, No. 956.) An experiment was made with a buffer of this kind on the Dublin and Kingston railway, which consisted "in bringing the carriage upon one of the lines, and causing ten or twelve of the railway porters to run it as fast as they could, full tilt against one of the stone walls of the station-house, *from which it rebounded like a piece of Indian-rubber.*" Sir Frederick Smith, the late able superintendent of railways, has also, in more than one of his reports to the Board of Trade, strongly recommended that every railway carriage, of whatever description, should be provided with buffers.

Now we do not ask why the Great Western Railway Company have not adopted either Sir George Cayley's plan or Mr. Mallett's, since it might possibly be pleaded in extenuation that no great time had yet elapsed since they were first promulgated; but we think we are in good reason entitled to ask whether all or any of the carriages in the train which met with the late unfortunate accident, were provided *with buffers of any sort?* Whether *any means whatever* were provided for enabling the carriages to sustain, without damage, any collision which might happen to them, in

the course of their hundred and eighteen miles of transit under the cloud of night? And what is the practice, in general, of the company, on this head? Are any of their other trains suitably provided with buffers? Or if not, what experiments or trials have they made, with a view to ascertain the best plan of so protecting them? All these are questions which ought to have been put at the inquest on the bodies of the persons killed, but *were not;* and it is the more necessary, therefore, that they should be put now, and distinct answers obtained. If we might give full credence to an assertion made by Mr. Saunders, that "*every* precaution that could be *thought* of to ensure punctuality and *safety*, has been *adopted* by the directors," there would be no need to push enquiry any farther; but we have just mentioned two very necessary and excellent "safety" plans which have been "thought of," but neither of which has, to a certainty, been "adopted;" and we doubt, exceedingly, whether it is in the power of the Great Western Directors to show that any better plan, or indeed any plan whatever, has been "adopted" by them, having the same essential object in view—namely, the protection of passengers from destruction or injury in cases of collision. We believe that it is quite within the limits of mechanical practicability, to render all such collisions harmless; and we can never hold any company free from serious blame, which does not use its best exertions to do so.

THE TERM "MEDIUM OF SPACE."

Sir,—So many disputes arise from a want of agreement in the meaning of terms, that I am induced to make the following observations respecting the term, "Medium of space," in Mr. Pasley's last communication. *Practician* may be a better term than *practitioner*, and "*Medium of space*" may be a better term than "*firmamental fluid*," but in both cases, do not both terms imply the same things? Is not "the medium of space" "the *freezing principle*," so long inquired about by philosophers? Would it be possible for motion to occur within it, if it did not itself undergo a chemical *change? And is there in* nature any *thing capable of producing* this physical change but the friction attendant on life? As every grain of sand tends to check the advance of the ocean, so every movement of animal life tends to promote the circulation of the universe. Heat and cold are, as every one knows, sensations; but they are sensations caused by different dispositions of matter, as we may see by their effects on substances which are devoid of sensation. The sensation of heat is caused by the motion of matter in the *form* of heat; and the sensation of *cold*, by the presence of more of the firmamental fluid, or "medium of space," than the vital energy can convert into heat with sufficient rapidity.

If animal life were extinct, the motion of the universe would cease, although the time for its entire cessation might be of long duration. Of course I mean mechanically—that is, without reference to the power of the Almighty. Surely *all* sensations are the effects of the action of matter, or the *recollection* of the effects of such action. It is useless in this world to pretend to free ourselves from matter; matter must be the stepping-stone to another sphere, whatever other assistance we may require. The immaterial I presume not to discuss. A white leaf and a black dye might express all the wonders of creation. The firmamental fluid, or "medium of space," with an atom, *can* account for them. Under this view of things Alfonzo "the Wise" would never have said, "If he had been consulted in the creation, he would have made the universe more simply."

Your obedient Servant,

E. A. M.

Dec. 22, 1841.

STEAM NAVIGATION OF THE ATLANTIC—THE RIVAL BRISTOL AND LIVERPOOL LINES.

[We copy the following historical retrospect from our excellent provincial contemporary, the *Bristol Magazine*. Although not free from the exaggeration of colouring common to all local effusions having for their object the exaltation of local achievements and interests, we consider it to be true in the main, and eminently deserving, on public grounds, of the attention of the public at large. To say how cordially we assent to all that is here said, in praise of the *Great Western* and her performances, would be only to repeat what we have before more than once said on the subject; but we may be ex-

cused, perhaps, for reminding our contemporary, who claims for Bristol exclusively the entire merit of all this vessel has accomplished, that *her machinery*, to which, more than any thing else, her pre-eminent success has been owing, were of *London make*, and, (at first, at least, if not to this day,) worked by *London engineers*.—ED. *M. M.*]

It will be fresh in the remembrance of many persons, that, previous to the starting of the *Great Western* on her first Trans-Atlantic trip, the idea of establishing steam communication regularly with the United States was held, very generally, to be a pure chimera; and a high scientific authority was understood to have stated in his lectures, that it never could be accomplished. During the time the *Great Western* was on the stocks, however, other parties, seeing the grand scale on which the attempt was to be made in Bristol, resolved to endeavour to eclipse it, by enlarging on the same plan in London. Thus the British and American Steam Navigation Company was formed; and, in order to deprive Bristol of the honour of being first in the field, they chartered one of the largest and most powerful steamers then in the world—the *Sirius*, of 700 tons, and 320-horse-power—a proportion, be it observed, which by ordinary calculation *ought* to have given her greater speed than the *Great Western*. This vessel was ostensibly put on to pre-occupy the ground for the *British Queen*, which was then building, and being sent round to Cork at the latter end of March, 1837, under the command of Lieut. Roberts, R.N., who was subsequently lost in the *President*,—she sailed thence for New York on the 4th of April, with a fine N.E. wind, and three days afterwards the *Great Western* started from Bristol for the same port, with a gale of wind "in her teeth," and with 240 miles further to run than the *Sirius*. Under these circumstances, it was not within the bounds of probability, in the absence of accident to either, that the *Great Western* could overtake the *Sirius*, and accordingly the latter did reach New York first, having arrived on the evening of the 22nd of April at New York, after a passage of *eighteen days from Cork*, and early the following morning the *Great Western* was reported, having arrived *from Bristol in fifteen and a half days*. Thus establishing her superiority so triumphantly, that the interest of the enterprize was speedily transferred to her; and it was evident to all, that no kind of comparison could be made between the suitableness of the two vessels for traversing the Atlantic. The voyage of the *Sirius* proved little or nothing; the distance between Ireland and New York had often been run by sailing vessels in less time than *eighteen days, though perhaps* scarcely ever on the outward passage. But, outward or homeward, no one ever heard of the distance between Bristol and New York being accomplished in fifteen days; and it was the *Great Western* alone, therefore, which even then established the entire success of the attempt.

Several competitors, entered the field, and two other steam-boats besides the *Sirius* started about the time of the *Great Western*, and managed to get across the Atlantic; but these either never repeated the attempt, or they gradually dropped off, while the *Great Western* still pursued "the even tenor of her way." Public attention, however, was in some measure diverted from the *Great Western* by the gigantic preparations of the British and American Steam Navigation Company, who appeared determined that her glories should be speedily eclipsed, or lost in the splendour of their own achievements. What Bristol had accomplished with such apparent facility, must be still more easy to London and Liverpool; and shortly afterwards the *British Queen*, and then the *Great Liverpool*, and the *President*, successively entered the lists, and disputed with her the supremacy of the Atlantic Ocean. In the mean time the attention of the government was attracted to the importance of establishing a mail communication by steam with the British Possessions in America; and it is understood that the *Great Western Steam Ship Company* offered for the contract, on terms very favourable to the Post Office Establishment. Whether it arose from the difficulty of impressing the government with the idea that any thing excellent, in the way of enterprise, could originate in Bristol or not, we cannot say, but without, we believe, any intermediate communication with the proprietary of the *Great Western*, some additional conditions were tagged to the proposals, which probably if they had been made aware of them, they would cheerfully have complied with, and the contract for the transmission of the British Mails, by way of Halifax and Boston, was given to a Liverpool house—who were *to build* vessels we know not how much superior to the *Great Western*—at an expense to the country of *fifteen thousand* a-year more than the Great Western Company required, and which has since been increased to thirty-five thousand a-year.

While these vessels are in preparation the competition on the Atlantic takes place, and the proprietors of the proud steam-ships, who scarcely thought it a compliment to hear them spoken of as rivals of the *Great Western*, were not long in discovering that to build a steam-vessel that should successfully contend with her for the palm of excellence, was not quite so easy as they had imagined.

The government contractors proceeded to carry out the terms of their agreement, and four large steamers, on the most approved models, were constructed for the purpose, with less bulk and greater power than the *Great Western*, from which it was expected that an increase of velocity and more punctuality would be secured; and against these vessels, which run to Halifax and Boston, with *eighty thousand a-year of the public money* to back them, the *Great Western* has had to compete single-handed for the last two seasons.

We do not wish to institute any invidious comparisons; but something is due to justice, and there are a few statistical facts connected with this subject which might form the ground of a curious enquiry. In the first place, the *Great Western* proprietary might reasonably have expected, without the slightest approach to anything like presumption, that our own government would feel some interest in the success of an undertaking which appeared to have attracted the sympathies of the whole civilized world. When it was understood that the *Great Western* had finally departed for America the press of Europe was occupied with the subject, and as the time approached for her return, nations stood on tip-toe awaiting the event. We need not dwell on the enthusiasm which seemed to pervade society at large on her successful return: it was like a national congratulation,—the winning of another battle of Waterloo, without its horrors. Again and again the experiment was repeated, and always with the same success; and when in the wide world she had not a competitor, and the Government saw the expediency of dispatching our North American mails by steam, what was more to be expected than that it would rejoice to throw in its powerful aid in support of an undertaking which had already earned "golden opinions from all sorts of people?" On the contrary, however, not only the *Great Western* Company obtained no preference, but they were not even allowed to carry the mails at *less* than any other Company could undertake them; and instead of receiving encouragement from the Government, a premium of 15,000*l.* a year was absolutely given for the building of vessels to oppose them, and as this, it appears, was not enough, a sop of 20,000*l.* a year has since been added to keep up the spirit of the thing.

We are well aware that the wisdom of Government is easily arraigned by taking a one-sided view only of a question; and it will naturally be inferred that its objects were such as could not be carried out by the *Great Western* proprietary, and that Liverpool was the most suitable port for the station of the vessels. We come, then, to inquire what the exigencies of the Post-Office service particularly demand,—evidently *speed* and *punctuality*; and, as far as these are concerned, it will not be difficult to show that, so far from gaining by making Liverpool the American mail station, it is a positive disadvantage to the country, and that in respect to the speed of transmission, the Government pays its thirty-five thousand a year *extra* for less than nothing.

We have not space, nor is it indeed necessary, to go into a regular analysis of the voyages of the *Great Western*, and the Liverpool and Halifax line of steamers. It is well known, that for speed the former has never, on any occasion, been surpassed on the Atlantic; while for punctuality, no kind of comparison can be made between the *Great Western* and any of her competitors. What, for instance, is more common than to see in the London papers such paragraphs as the following:—"No account of the *Caledonia* yet, now three days over-due." "Some anxiety is felt respecting the *Colombia*, which ought to have arrived on Tuesday last," "We are still unable to give our readers any account of the arrival of the *Arcadia*." And we are sure the vigilant gentlemen connected with the London press in this city will bear us out in saying that nothing is more *un*common than their being kept waiting at Pill *six hours* for the arrival of the *Great Western*. And as to the general question of the relative merits of the *Great Wester*, and Bristol, *versus* Liverpool and the Halifax steamers, the last voyage will afford a very good criterion for estimating the whole.

The *Britannia* left Liverpool for Halifax and Boston on the 21st of October; and the *Great Western, two days afterwards*, left Bristol for New York, having to pass Halifax and Boston; from the latter of which there is railway communication with New York, notwithstanding which she delivered her letters in New York *nine hours before the arrival of the mail per Britannia*.

On the return voyage, the *Britannia* got home in fourteen days, (exclusive of delay at Halifax,) to Liverpool; and the *Great Western*, with a day's steaming farther to run, in thirteen and a quarter, to Bristol, the latter delivering her news in London within thirty hours of the time of passing Cape Clear; a period in which, without fear of falling into the error of Dr. Lardner, we may safely assert it never was, nor ever *can* be done by way of Liverpool. Nothing, therefore, can be more certain than that at the present time the New York letters, posted per the *Great Western*, are delivered in Liverpool sooner, *via* Bristol, than they could be by their own mails direct, if sailing at the same time; and it is equally easy of demonstration, that even

if the *Great Western* had no advantage over them in point of speed, the same end would be secured in a general way, were the Gloucester and Bristol railway completed.

The distance between the Bristol and the Liverpool courses, in favour of the former, calculated to a point of junction off Cape Clear, we will only estimate at forty miles, though we find that, when it is a question of the distance run, they call it seventy in Liverpool; and we will allow this forty to be run, on an average, in four hours. Now we know it for a fact, from the best authority, that there is occasionally only *nine feet*, at low water, in the Victoria Channel, at Liverpool, and that a steam-vessel, drawing *twelve and a half feet*, may be detained *five* hours outside. All the Halifax line have been detained—the *Britannia* was detained three and a half hours her very first voyage—and allowing, on an average, that this disadvantage will make the difference six hours in favour of Bristol, it is not too much to say, that when the Gloucester and Bristol railway is opened, we shall be enabled to deliver the American letters in Liverpool, *via* Bristol, sooner than they could get them by sea direct.

PRACTICE AND PRACTICIANS, *v.* MATHEMATICS AND MATHEMATICIANS.—S. Y. IN REPLY TO MR. CHEVERTON.

Sir,—If what somebody said of me "many, very many years ago," had been as unimportant to Mr. Cheverton as it is irrelevant to the present discussion, he would not have quoted it. It is with my *remarks* he has to contend: what somebody said I should be, or what I am, it is impertinent on his part to observe upon. But if Mr. C. wrote the paper from which he quotes, (for I have entirely forgotten both it and the occasion of it,) he may console himself by imagining that, whatever I may be, I *might* have been something worse, if the "censure" he has treasured in his memory for the aforesaid "very many years" had not "alighted" on my devoted head.

If Mr. Cheverton's paper, in No. 956, had explained and enforced the necessity of caution in the application of mathematical theories to practical purposes, I should not have found fault with it; but its tendency appears to me to be widely different, and also to be utterly pernicious; and I read it with feelings of great indignation. I am old enough to remember the time when practical men regarded theorists with a feeling nearly allied to contempt and dislike; I have seen this feeling gradually give place to a better one, arising from more enlightened views; and I have seen with delight the benefits derived by both classes—but more particularly my own—from the greater intimacy and better understanding which has grown up between them. While this is progressing, in a manner which must gratify all lovers of knowledge, up starts Mr. Cheverton, and does his best to persuade the less educated class that it is the superior of the two; that the science which is more general in its application, and more extensively useful than any other, is a noxious science; that it produces something worse than "baneful effects;" that it is a science "feeble" in means, but "arrogant of pretension," &c. &c.; and I did his paper the undeserved honour of getting angry with it.

I did not expect that my remarks, which appeared in No. 958, would be particularly pleasing to Mr. Cheverton; but he was not considered when they were written. I attacked his statements and his arguments; and, by way of defence, he, in No. 959, attacked *me* and my *manner*; neither, it seems, is to his taste, which is a misfortune about which your readers will probably not feel any great concern, and which I have not leisure to deplore. As to whether I have shown an inclination to "distort and misrepresent" Mr. Cheverton's statements, your readers can judge for themselves, if they choose to take the trouble.

Almost all the rest of Mr. C.'s paper, in No. 959, is personal, and I shall take no further notice of it; not because I wish to show any contempt for such remarks, which are of a nature that I believe Mr. C. does not often indulge in, but because I think your readers will not derive much benefit from such discussions.

Yours, &c. &c.

S. Y. (an Engineer.)

December 27, 1841.

P.S.—Perhaps Mr. Cheverton will perceive that, after the objection I raised has been obviated by the alteration of Professor Moseley's machine, it will not be exactly the same machine that he eulogized so highly in No. 956; and possibly he will enlighten your readers by describing *one* of the "many expedients" he mentions at page 510.

AMERICAN TIMBER.

[From a paper on the Building Materials of the United States of North America. By David Stevenson, C. E., Edinburgh. From the Transactions of the Royal Scottish Society of Arts. Session 1841.]

The forests, to the British eye, are perhaps the most interesting features in the United States, and to them the Americans are indebted for the greater part of the materials of which their public works are constructed.

These forests are understood to have originally extended, with little exception, from the sea-coast to the confines of the extensive prairies of the western states; but the effects of cultivation can now be traced as far as the foot of the Alleghany Mountains, the greater part of the land between them and the ocean having been cleared and brought into cultivation. It is much to be regretted that the early settlers, in clearing this country, were not directed by a systematic plan of operations, so as to have left some relics of the natural produce of the soil, which would have sheltered the fields and enlivened the face of the country, while at the same time they might, by cultivation, have been made to serve the more important object of promoting the growth of timber. Large tracts of country, however, which were formerly thickly covered with the finest timber, are now almost without a single shrub, every thing having fallen before the woodman's axe; and in this indiscriminate massacre there can be no doubt that many millions of noble trees have been left to rot, or, what is scarcely to be less regretted, have been consumed as fire-wood. This work of general destruction is still going forward in the western states, in which cultivation is gradually extending; and the formation of some laws regulating the clearing of land, and enforcing an obligation on every settler to save a quantity of timber, which might perhaps be made to bear a certain proportion to every acre of land which is cleared, is a subject which I should conceive to be not unworthy of the attention of the American Government, and one which is intimately connected with the future prosperity of the country. But should population and cultivation continue to increase in the same ratio, and the clearing of land be conducted in the same indiscriminate manner as hitherto, another hundred years may see the United States a *treeless* country. The same remarks apply, in some measure, to our own provinces of Upper and Lower Canada, in many parts of which the clearing of the land has shorn the country of its foliage, and nothing now remains but blackened and weather-beaten trunks.

The progress of population and agriculture, however, has not as yet been able entirely to change the natural appearance of the country. Many large forests and much valuable timber still remain both in Canada and in the United States; the Alleghany Mountains, as well as other large tracts of country towards the north and west, which are yet uninhabited, being still covered with dense and unexplored forests.

The timber trade of the United States and of Canada, from the quantity of wood which is required for home consumption and exportation, is a source of employment and emolument to a great mass of the population. It is carried on to a greater or less extent on all American rivers, but the Mississippi and the St. Lawrence are more especially famous for it. The chief raftsmen, under whose direction the timber expeditions on these rivers are conducted, are generally persons of great intelligence, and often of considerable wealth. Sometimes these men, for the purpose of obtaining wood, purchase a piece of land, which they sell after it has been cleared; but more generally they purchase only the timber from the proprietors of the land on which it grows. The chief raftsman and his detachment of workmen repair to the forest about the month of November, and are occupied during the whole of the winter months in felling trees, dressing them into logs, and dragging them with teams of oxen on the hardened snow, with which the country is then covered, to the nearest stream. They live during this period in temporary wooden huts. About the middle of May, when the ice leaves the rivers, the logs of timber that have been prepared and hauled down during winter are lanched into the stream, and being formed into rafts, are floated to their destination. The rafts are furnished with masts and sails, and are steered by means of long oars, which project in front, as well as behind them: wooden houses are built on them for the accommodation of the crews and their families. I have several times, in the course of the trips which I made on the St. Lawrence, counted upwards of thirty men working the steering oars of the large rafts on that river, from which some idea may be formed of the number of their inhabitants. Those rafts are brought down the American rivers from distances varying from one hundred to twelve hundred miles, and six months are often occupied in making the passage. When it is at all possible, they moor them during the night in the still water at the edge of the river; but when this cannot be done, they continue their perilous voyage in the dark, exhibiting lights at each corner of the raft to warn vessels of their approach to them. The St. Lawrence rafts vary from 40,000 to 300,000 square feet, or from about one to no less than seven acres in surface, and some of them contain as much as 5000*l.* worth of timber. If not managed with great skill, these unwieldy specimens of naval architecture are apt to go to pieces in descending the rapids, and it not unfrequently happens that the labour of one, and sometimes two seasons is in this way lost in a moment. An old and experienced raftsman, with whom I had some conversa-

tion on board of one of the St. Lawrence steamers, informed me that he, on one occasion, lost 2,500*l.* by one raft, which grounded in descending a rapid and broke up. He said the safest size for a raft was from 40,000 to 50,000 square feet, or about one acre, and that five men were required to work a raft of that size.

The species of forest trees indigenous to different countries is an interesting subject connected with vegetable physiology. There are said to be about thirty forest trees indigenous to Great Britain, which attain the height of thirty feet; and in France there are about the same number. But according to the best authorities, there are no less than 140 species, which attain a similar height, indigenous to the United States.

To notice each of these numerous species, whose timber is employed by the Americans in the arts, even if I were able to do so, would greatly exceed the limits to which I am restricted by the nature of the present communication; and I shall therefore only make a few remarks regarding those timbers which are most highly prized and most extensively used in the ship carpentry and public works of the country.

The first which I shall notice is the Live Oak (*Quercus virens*,) so named because it is an evergreen, its leaves lasting during several years, and being partially renewed every spring. It grows only in the southern states, and is one of the most valuable of the American timbers. The duty imposed by our government on wood from the United States prevents its importation into Britain, and as live oak grows only in the United States, and is not found in Canada, it consequently never reaches this country as an article of commerce; the whole produce being consumed by the Americans themselves in ship-building. Its specific gravity is equal to, and in some cases greater than, that of water, and it is used along with white oak and cedar for the principal timbers of vessels. The climate, according to an American authority,* becomes mild enough for its growth near Norfolk, in Virginia, though at that place it is less multiplied and less vigorous than in more southerly latitudes. From Norfolk it spreads along the coast for a distance of 1,500 or 1,800 miles, extending beyond the mouths of the Mississippi. The sea air seems essential to its existence, for it is rarely found in the forests upon the main-land, and never more than fifteen or twenty miles from the shore. It is most abundant, most fully developed, and of the best quality, about the bays and creeks, and on the numerous fertile islands which lie scattered for several hundred miles along the coast. The live oak is generally forty or fifty feet in height, and from one to two feet in diameter; but it is sometimes much larger, and its trunk is often undivided for eighteen or twenty feet. There can be little doubt, from its great density and durability, that this is one of the finest species of oak that exists, surpassing even that for which Great Britain is so famous. Its cultivation has been tried in this country, without success; but could it be imported, it would be found admirably suited for the construction of lock-gates, and other engineering works, for which hard and durable timber is required, and for which English or African oak is generally used.

The White Oak (*Quercus alba*,) is the species of which so much is imported into this country. It is known by the name of "American oak," but it is a very different and much inferior wood to the live oak of the United States which I have just described. It is also much more widely distributed, and occurs in much greater quantity, than the live oak. It is very common throughout the northern states, and in Canada, from whence it is exported to this country. It attains an elevation of seventy or eighty feet, with a diameter of six or seven feet. It is known by the whiteness of its bark, from which it derives its name, and from a few of its leaves remaining on the branches in a withered state throughout the winter. The wood is of a reddish colour, and in that respect is very similar to English oak. But it is generally acknowledged to be greatly inferior to it in strength and durability. It is very straight in the fibre, however, and can be got in pieces of great length and considerable scantling—properties which, for certain purposes, make it preferable to the British oak. It is much used in ship-building, and also for the transverse sleepers of railways. There are many other oaks in the United States, but the two I have mentioned are those most in use.

The pines are perhaps the next woods in importance to the oaks. The species of those are also very numerous, and I shall only mention one or two of the most important of them.

The White, or Weymouth Pine, (*Pinus strobus*,) is widely distributed both in the United States and in Canada, and is exported to Britain in great quantities from the latter country. It is the tallest tree of the American forest, having been known, according to Michaux, to attain the height of 180 feet. The wood has not much strength, but it is free from knots, and is easily wrought. It is very extensively employed in the erection

* The Sylva Americana, by J. D. Browne. Boston, 1832.

of bridges, particularly *frame* and *lattice* bridges, a construction peculiar to the United States, and very generally adopted in that country, which I have described in detail elsewhere.* For this purpose it is well fitted, on account of its lightness and rigidity, and also because it is found to be less apt to *warp* or *cast*, on exposure to the atmosphere, than most other timbers of the country. It is much used for the interior fittings of houses, and for the masts and spars of vessels.

The Yellow Pine, (*Pinus mitis* or *variabilis*,) occurs only in the southern and middle states, and is not found in Canada, and therefore does not reach this country, the wood known by that name in Britain being the *Pinus resinosa*. It attains the height of 50 or 60 feet, with a diameter of 2 or 3 feet, and is the timber which the Americans employ in greatest quantity for the masts, yards, booms, and bowsprits of their vessels. A large quantity of it is annually consumed for this purpose in the building-yards of New York, Philadelphia, and Baltimore.

The Red Pine (*Pinus resinosa*) is the only other of the pine species that is much used, It occurs in great plenty in the northern and middle states, and in Canada, from whence it is exported in great quantity to this country, and it is known to us by the name of "American yellow pine." It attains the height of 70 or 80 feet, with a diameter of two feet, and is remarkable for the uniform size of its trunk for two-thirds of its height. Its name is derived from the redness of its bark. The wood, owing to the resinous matter it contains, is heavy; and is highly esteemed for naval architecture, more especially for decks of vessels, both in this country and in America.

The Locust (*Robinia pseud-acacia*), from the beauty of its foliage and the excellent qualities of its timber, is justly held in great esteem in America. It abounds in the middle states, and in some situations attains the height of seventy feet, with a diameter of four feet. The wood of the locust tree is of a greenish-yellow colour, marked with brown veins, not unlike the laburnum of this country. It is a close-grained, hard, and compact wood, and is of great strength. It is used, along with live oak and cedar, for the upper timbers of vessels, and is almost invariably used for treenails, to which it is well adapted. It is also employed in some parts of the country as transverse sleepers for railways. Its growth being chiefly confined to the United States, it is not imported into Britain. It is one of the very few trees that are planted by the Americans, and may be seen forming hedge-rows in the highly cultivated parts of Pennsylvania.

The Red Cedar (*Juniperus Virginiana*) is another valuable wood, the growth of which is confined to the United States. In situations where the soil is favourable, it grows to the height of 40 or 50 feet, with a diameter of 12 or 13 inches. This wood is of a bright red colour; it is odorous, compact, fine-grained, and very light, and is used, as already stated, in ship-building, along with live oak and locust, to compensate for their weight. It is considered one of the most durable woods of the United States, and being less affected by heat or moisture than almost any other, it is much employed for railway sleepers. I remember, in travelling on some of the railways, to have been most pleasantly regaled for miles together, with the aroma of the newly laid sleepers of this wood. It is now, however, becoming too scarce and valuable to be used for this purpose.

The White Cedar (*Cupressus thyoides*) and the Arbor Vitæ (*Thuja occidentalis*) are employed for sleepers and other purposes to which the red cedar is applied, but the latter is preferred when it can be obtained.

The only other tree which I shall notice is the Sugar Maple (*Acer saccharinum*), which occurs in great abundance in Canada and the northern states. It attains the height of 50 or 60 feet, and is from 12 to 18 inches in diameter. The wood of this tree is soft, and when exposed to moisture it soon decays. It is very close-grained, and when cut in certain directions is remarkably beautiful, its fibres, owing to their peculiar arrangement, producing a surface variegated with undulations and spots. It is also susceptible of a very high polish. These qualities tend to render it a valuable acquisition to the list of American woods for ornamental purposes, for which it is very generally employed, and is well known in this country by the name of "Bird's Eye Maple." The wood of the Red-flowering Maple (*Acer rubrum*) is also employed for ornamental purposes, and is generally known by the name of "Curled Maple." The cabins of almost all American-built vessels are lined with these woods, or with mahogany inlaid with them, and they are also much used for making the finer parts of the furniture of houses.

The property of the sugar maple, however, from which it derives its name, is of perhaps more importance, in a commercial point of view, than its use as timber. I allude to its property of distilling a rich sap, from which sugar is largely manufactured throughout the United States. From two to four pounds of sugar can be extracted annually from each tree without hurting its growth. I had an

* Stevenson's Sketch of the Civil Engineering of North America. London: John Weale, 1838.

unity of making some inquiries regard-s simple process when on the banks of 'er Ohio, where I saw it in progress. r two holes are bored with an augur, height of about two feet from the l, and into them wooden tubes, formed branch of some soft-hearted tree hol- out, are inserted. The sap oozing the maple flows through the tubes, and lected in troughs. It is then boiled a syrup is formed of sufficient strength ome solid on cooling, when it is run noulds and is ready for use.

:h is a brief notice of some of the prin- timbers of the United States, which, their great abundance and variety, are le for almost every purpose connected :he arts, and thus serve in some degree npensate for the want of stone, while same time they afford great advantages e prosecution of every branch of car- y. an art which has been brought to perfection in that country. Many in- is constructions have been devised to r timber applicable to all the purposes il architecture, and in no branch of ering is this more strikingly exemplified n bridge-building. Excepting a few rubble arches of inconsiderable span, is not a stone-bridge in the whole of nited States or Canada. But many n bridges have been constructed. l of them, as is well known, are up- of a mile and a quarter in length, and ebrated Schuylkill Bridge at Philadel- which was burnt about two years ago, s in existence when I visited the coun- nsisted of a single timber-arch of no an 320 feet span. Canal locks and ucts, weirs, quays, breakwaters, and all r of engineering works have there been , in which wood is the material chiefly ed; so that if we characterize Scot- a stone, and England as a brick coun- may, notwithstanding its granite and , safely characterize the United States untry of timber.

all only, in conclusion, very briefly to the *appearance* of the American , of which so much has been written d, and on this subject I may remark, is quite possible to travel a great dis- without meeting with a single tree of rge dimensions; but the traveller, I cannot fail very soon to discover that erage size of the trees is far above s to be met with in this country. I 'ed many trees, varying from 15 to 20 circumference, and the largest which an opportunity of actually measuring Button-wood tree (*Platanus occiden-* on the banks of Lake Erie, which I o be twenty-one feet in circumference. many trees, however, in travelling through the Americen forests, which evidently far exceeded that size, and which my situation, as a passenger in a public conveyance, prevented me from measuring.

M. Michaux, who has written on the forest trees of America, in speaking of their great size, states, that on a small island in the Ohio, fifteen miles above the river Muskingum, there was a button-wood tree, which, at five feet from the ground, measured 40 feet 4 inches in circumference. He mentions having met with a tree of the same species on the right bank of the Ohio, thirty-six miles above Marietta, whose base was swollen in an extraordinary manner; at four feet from the ground it measured 47 feet in circumference, giving a diameter of no less than 15 feet 8 inches; and another of nearly as great dimensions is mentioned by him as existing in Genessee; but these trees had perhaps been swollen to this enormous size from the effects of some disease. He also measured two trunks of white or Weymouth pine, on the river Kennebec, in a healthy state, one of which was 154 feet long, and 54 inches in diameter, and the other was 142 feet long, and 44 inches in diameter, at three feet from the ground. M. Michaux also measured a white pine which was 6 feet in diameter, and had reached probably the greatest height attained by the species, its top being 180 feet from the ground. It is difficult for an inhabitant of our island, without having seen the American forests to credit the statements which have been made by various authors, as to the existence of these gigantic trees of 180 feet in height (being about 40 feet higher than Melville's monument in St. Andrew-square, in Edinburgh;) but such trees undoubtedly do exist. Mr. James Macnab, of the Royal Botanic Garden, in a paper on the local distribution of different species of trees in the native forests of America,* mentions having measured numerous specimens of the *Pinus strobus* in Canada, which averaged 16 feet in circumference, and 160 feet in height; and one specimen, which had been blown down, and of which the top had been broken off, measured 88 feet in length, and even at this height was 18 inches in diameter.

The ascent of the sap in trees is a subject which has long occupied the attention of physiologists. Some difference of opinion, however, exists regarding it, and hitherto, it is believed, no very definite conclusions have been arrived at;—and although not strictly connected with the subject of this paper, I may be excused for remarking, that the quantity of sap required to sustain such enormous trees as these I have been describing, and the source and nature of the power by which a

* Agricultural Journal for 1835.

supply of fluid is raised and kept up, at the great height of 180 feet from the ground, are inquiries which, could they be satisfactorily solved, would form most interesting and instructive additions to our knowledge regarding vegetable physiology.

LIST OF PATENTS GRANTED FOR SCOTLAND BETWEEN THE 12TH OF NOVEMBER AND THE 20TH OF DECEMBER, 1841.

John Annes, of Plymouth, painter, for a new and improved method of making paint from materials not before used for that purpose. Nov. 12, 1841

William Palmer, of Sutton-street, Clerkenwell, Middlesex, manufacturer, for improvements in the manufacture of candles. (Being a communication from abroad, and partly by invention of his own.) November 17.

George Bent Ollivant and Adam Howard, of Manchester, mill-wrights, for certain improvements in cylindrical printing machinery, for printing calicoes and other fabrics, and the apparatus connected therewith, which is also applicable to other useful purposes. November 17.

John Steward, of Wolverhampton, Esq., for certain improvements in the construction of pianofortes. November 22.

George Lowe, of London, civil engineer, for improved methods of supplying gas under certain circumstances, and of improving its purity and illuminating power. November 24.

William Edward Newton, of 66, Chancery-lane, civil engineer, for certain improvements in the production of ammonia. (Being a communication from abroad.) December 1.

James Balderston, of Paisley, manufacturer, for certain improvements in machinery, or apparatus for doubling, twisting, twining, and finishing cotton and other fibrous substances. December 7.

James Colman, of Stoke, Holy Cross, county of Norfolk, starch-manufacturer, for improvements in the manufacture of starch. December 10.

Alexander Parkes, of Birmingham, for certain improvements in the production of works of art in metal by electric deposition. December 10.

William Irving, of Rotherhithe, gentleman, for improvements in the manufacture of bricks and tiles. December 10.

George Hickes, of Huddersfield, York, agent, for an improved machine for cleaning or freeing wool and other fibrous materials, of burs and other extraneous substances. December 10.

Joseph Needham Taylor, of Devonport, a post captain in her Majesty's Navy, for a certain method or certain methods of abating or lessening the shock or force of the waves of the ocean, lakes, or rivers, and of reducing them to the comparatively harmless state known by the term, "broken water," and thereby preventing the injury done to, and increasing the durability of, breakwaters, mole-heads, piers, fortifications, lighthouses, docks, wharfs, landing-places, embankments, bridges, or pontoon bridges, and also of adding to the security and defence of harbours, road-steads, anchorages, and other places exposed to the violent action of the waves. December 11.

Robert Holt, of Manchester, cotton spinner, and Robinson Jackson, of Manchester, engineer, for certain improvements in machinery or apparatus for the production of rotary motion for obtaining mechanical power, which said improvements are also applicable for raising and impelling fluids. December 11.

William Hill Darker, senior, and William Hill Darker, junior, both of Lambeth, engineers, and William Wood of Wilton, in the county of Wilts, carpet-manufacturer, for certain improvements in looms for weaving. December 14.

Archibald Templeton, of Lancaster, silk-spinner, for a new or improved method of preparing for spinning silk and other fibrous materials. December 16.

James Colley March, of Barnstaple, surgeon, for certain improved means of producing heat from the combustion of certain kinds of fuel. Dec. 16.

Christopher Dumont, of Mentz, but now residing in Mark-lane, London, gentleman, for improvements in the manufacture of metallic letters figures, and other devices. (Being a communication from abroad.) December 16.

Morris West Ruthven, of Rotherham, engineer, for a new mode of encreasing the power of certain media when acted upon by rotary fans or other similar apparatus. December 16.

Henry Augustus Wells, of Regent-street, gentleman, for improvements in machinery for driving piles. (Being a communication from abroad.) December 17.

Henry Booth, of Liverpool, Esq., for improvements in the method of propelling vessels through water. December 17.

John Hale, of Breezes Hill, Ratcliff Highway, sugar-refiner, for improvements in the construction of boilers for generating steam, and in the application of steam to mechanical power. December 17.

Henry Browne, of Codnor Park Iron Works, Derby, iron manufacturer, for improvements in the manufacture of steel. December 18.

William Newton, of 66, Chancery-lane, civil engineer, for certain improvements in engines to be worked by gas, vapour, or steam. (Being a communication from abroad.) December 20.

LIST OF PATENTS FOR IRELAND GRANTED IN NOVEMBER, 1841.

W. E. Newton, for certain improvements in the manufacture of fuel.

L. Kortwright, for certain improvements in treating and preparing the substance commonly called whalebone, and the fins, and such like other parts of whales, and rendering the same fit for various commercial and useful purposes.

R. L. Sturtevant, for certain improvements in the manufacture of soap.

M. J. Roberts and W. Brown, for certain improvements in the process of dyeing various matters, whether the raw material of wool, silk, flax, hemp, cotton, or other similar fibrous substances; or the same substances in any stage of manufacture; and in the preparation of pigments, or painters' colours.

W. Scamp, for an application of machinery to steam-vessels for the removal of sand, mud, soil, and other matters, from the sea, rivers, docks, harbours, and other bodies of waters.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 961.] SATURDAY, JANUARY 8, 1842. [Price 3*d*.

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HARRIS'S NEW MARINER'S COMPASS.

Fig. 2.

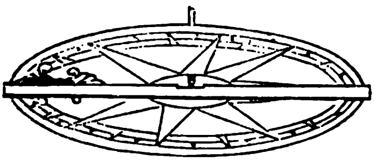
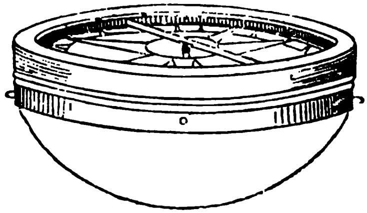


Fig. 6.



A Fig. 1. B

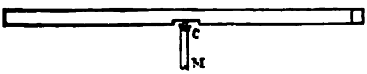


Fig. 3.

Fig. 4.

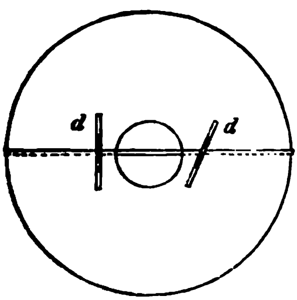
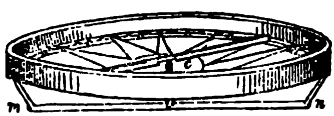


Fig. 5.



DESCRIPTION OF A NEW MARINER'S COMPASS, INVENTED BY W. SNOW HARRIS, ESQ., F. R. S.

In the year 1825, Mons. Arago discovered the influence of metallic bodies in arresting the vibration of the magnetic needle; he showed that the amplitude of the arcs of vibration when the needle oscillated within a ring of metal, became sensibly reduced, and the needle tended rapidly to a state of rest; he further discovered, that when a magnet was delicately balanced on a fine centre, and placed near the surface of a rapidly revolving metallic plate, it would be soon greatly disturbed, would begin to oscillate, and would, if the motion of the plate were sufficiently rapid, be dragged round with the plate.

The results were further pursued and investigated in this country by Sir John Herschell, Mr. Babbage, and also by Mr. Harris, who repeated the experiments in vacuo; their researches led to the development of new facts of great practical consequence.*

Faraday, with a power of physical research peculiar to himself, has since shown that the force which thus fetters and restrains the magnetic oscillation, is not the result of ordinary magnetic action, but is dependant on the generation of electrical currents induced by the magnet whilst in motion, in the metallic ring; and which he terms Magneto Electric Induction; no attractive power between the bodies being observable in a state of rest.

These facts having been fully established, we are enabled to apply the general principle, with perfect safety, in restraining the inconvenient oscillations of the compass on ship board, so as to confine it as nearly as possible to its natural direction, without in any way interfering with its delicacy, or any liability to error from the restraining cause, and thus avoid the disturbing motion, which often arises from the rolling and pitching of the ship.

This is the new feature in the compass invented by Mr. Snow Harris, and which is now about to be described.

The compass needle consists of a straight bar A B, fig. 1, about 7 inches long, ½ an inch wide, and ⅛th of an inch thick, it is made of fine steel, well tempered and hardened throughout its whole length; it is placed edgeways, and is delicately balanced on a fine point at C, resting on a centre of agate. Instead of the ordinary compass card, a transparent circular disc of talc, figs. 2 and 3, is attached to the bar, at its under edge, on which the different points, &c., are either painted in transparent colours, or otherwise laid on it, on very thin paper, so that the whole is quite transparent, and in order to ensure and regulate the horizontal position of the whole, at any time or place, there are two small sliders of brass, *d d*, fig. 4, underneath, and on each side of the centre, so contrived as to slide and turn with friction into any required direction by means of two slits in them and small stop screws.

The compass bar with its talc circle beneath, is now placed centrally within a ring of hammered or rolled copper as in fig. 5, the poles of the bar, which project a little beyond the card, being distant from the interior of the ring, about ⅛th, or ¼th of an inch. This copper ring is about 1¼ inch wide, and ⅛th thick; it is turned up and finished in a lathe, so as to be perfectly circular; the centre piece M, fig. 1, carrying the needle, is supported on a cross bar *m n*, fig. 5, attached to the ring, and the centre part *c*, accurately adjusted in the lathe.

The whole is finally set within a glass bowl or other case, according as it is required to light the compass from beneath or above, and placed in gimbles in the usual way,—the perfect transparency of the single disc of talc renders the compass card very visible and clear when lighted from beneath.

The great steadiness of this compass under all sorts of motion is very remarkable. It has been successfully tried in a few ships of the navy, and is still on trial. The needle being placed on its edge, it is liable to little error in its magnetic line; it has, besides, great magnetic energy and great delicacy of suspension, and is unembarrassed by a heavy card—whilst at the same time, the magneto-electrical induction on the copper ring effectually preserves its natural direction undisturbed. These are advantages of no ordinary kind.

* *Philosophical Transactions for 1825 and 1831, pts. 1 and 2.*

Mr. Harris has shown (Transactions of the Royal Society for 1831,) that when a magnetic bar oscillates freely within a series of concentric rings of copper, accurately and closely fitted one within the other, the restraining force of the copper with a given magnet, is inversely as the squares of the distances from the pole of the bar, and directly as the quantity of copper within the sphere of its action, the matter being supposed to be condensed into an indefinitely thin ring, and taken at some intermediate, or mean distance within the surface, where the sum of the forces may be supposed to produce the same effect as if exerted from every part of the mass, and that hence the energy is also directly as the density. He also found that with a given magnetic tension in the bar, the restraining force no longer increased sensibly after a certain number of rings, that in fact the number of rings requisite to exhaust, as it were, the magnetic force, varied in some ratio of the power of the magnet; thus with the bar employed, no sensible increase of energy in the whole was observable, after the tenth ring, the effect being the same with ten as with any greater number of rings.

In the application therefore of a copper ring to the purpose of restraining the oscillations of the compass at sea, it is desirable to have the poles of the bar as near as we can to the interior of the ring, to have the copper as dense as possible, and to give it greater or less thickness, in proportion to the power of the compass bar. Much has been said, and many experiments tried, with a view of determining the best form for a compass needle; it will, however, probably be found, that the simple bar above dedescribed is, upon the whole, not only the most accurate, but in every respect the best. Its form greatly simplifies the workmanship necessary to its construction, and admits of the various other scientific processes upon which its action depends, being easily and perfectly carried out. If the steel be well chosen, and be properly tempered, such a bar is susceptible of a very high degree of magnetic energy, which it will be found to completely retain.—*Transactions of the Royal Cornwall Polytechnic Society.*

FREEZING OF WATER PIPES.

Sir,—We may soon expect further evidence of "winter's icy hand" being upon us; and amongst the many shapes in which this evidence will be afforded is, the annoyance to housekeepers by the freezing and bursting of water-pipes.

Some people look upon this as a necessary consequence of frost; a sort of "compliment of the season," to be regularly expected, and by no means to be guarded against. Other persons desire to be freed from this annoyance, of which they have a very keen remembrance from previous visits; and, in order to provide a remedy, they wrap a slight twist of hay, a few old rags, or a solitary piece of matting, round that portion of the service-pipe which is exposed to the inclemency of the weather. These matters are all very good non-conductors, and would effectually answer the purpose, if applied in *sufficient bulk;* but it almost invariably happens that this circumstance is either overlooked or misunderstood. In fact, the difficulty of surrounding the pipe with a sufficient quantity of non-conducting material amounts, in many cases, almost to an impossibility.

The plan which I have successfully adopted is, to inclose the external portion of the water-pipe in a deal case or trough fitted to the wall, about four inches square, which is filled with finely-sifted coal ashes, which is a most excellent non-conductor, and perfectly surrounds and encloses every portion of the pipe.

My water-pipe is in some degree sheltered, and for more exposed situations a larger mass of ashes might be required; but it is very easy to be on the safe side, by using a little excess.

I have in a few instances seen Russell's welded iron gas tubing used for external service-pipes for water, and its adoption for this purpose, in all exposed situations, would prevent the continual burstings which severe weather always produces, and prove a great saving to the proprietor.

I remain, Sir,
Yours respectfully,
W. BADDELEY.

29, Alfred-street, Islington.
December 27, 1841.

The members of the Institution of Civil Engineers, having given an extensive publicity, as well as a sort of implied sanction, to the contents of a paper lately read before that body, "On the Properties and Chemical Constitution of Coal," by a Mr. Charles Hood, abounding in the grossest errors, theoretical and practical, and which, if allowed to pass unnoticed and uncorrected, might obstruct the progress of those just views of the subject, developed by our correspondent, Mr. Williams, in his admirable work On Combustion, and further enforced in the series of papers by that gentleman, now in course of publication in our journal—we readily publish at the request of an esteemed correspondent, (not Mr. Williams,) the following notes on the paper in question by Dr. Kane, of Dublin; which if they do not touch all its many vulnerable points, will, at least, serve to give a tolerably correct notion of its general character. The Mr. Hood, whose ignorance is here exposed, is the same person to whom the Council of the Institution of Engineers, in some fit of somnolency, voted, about a year ago, one of their pretty medals for an essay of kindred worth, on warming and ventilation. Whether it be hot coals, or hot water, this gentleman meddles with, it seems to be equally his fate to *burn his fingers*.

Notes by Dr. Kane, on Mr. Hood's Paper.

1st. The light carburetted hydrogen is not, as asserted by Mr. Hood, among the *first* products of the distillation of coal; but it is formed, on the contrary, only when the volatile resin-oils and the olefiant gas (which are, in reality, the first products,) are decomposed by sweeping over the ignited surface of coal, or metal of the retort, or its contents. When olefiant gas is passed through tubes heated to bright redness it deposits half its carbon, and, without changing its volume, is converted into light carburetted hydrogen. If it be frequently passed backwards and forwards through the tube, it deposits all its carbon, and the residual gas (the volume of which is doubled) is found to be pure hydrogen. The products of the distillation of coal may be arranged according to the temperature at which they may be produced, as follows:—

1st. Lowest temperature .	Solids, as naphthaline, solid resins, and fluids, with high boiling points.
2nd, or next temperature .	Fluids which are very volatile.
3rd Stage . . .	Olefiant gas.
4th Stage . . .	Light carburetted hydrogen gas.
5th, or highest temperature,	Hydrogen gas.

In practice, however, the results of two or three stages are always mixed together.

2d. Light carburetted hydrogen is more difficult to inflame than olefiant gas (Mr. Hood's paper states the reverse.) Davy has fully proved this; and I have verified his result, that a mixture of air and olefiant gas will explode at a temperature that will not produce action on a mixture of air and light carburetted hydrogen.

3rd. The heat produced by olefiant gas, in burning, is greater than that produced by the combustion of the same volume of light carburetted hydrogen in the proportion of 27 to 18. The weights are then, however, as their specific gravities—that is, as 98 is to 56. If we plunge a piece *of bright red charcoal, or a* bright red *iron rod, into a mixture* of olefiant gas *and air, it will explode*; but we may immerse the charcoal and iron, white hot, into a mixture of light carburetted hydrogen without any danger. The whole use of the safety lamp depends on this.

4th. Mr. Hood is quite in error respecting the source of the ascensional power of gas and its law; it has nothing to do with the law of tranquil diffusion into space, with which he has confounded it.

5th. He is also wrong respecting the source of the great heating powers of the resin fuel. The idea of an increased draught from the quantity of vapour formed is also quite incorrect.

6th. There is nothing gained by the production of a gas requiring less oxygen (as Mr. Hood supposes) than olefiant gas does, for there would then be less heat produced. The quantity of heat evolved in the burning of any body is proportional to the quantity of oxygen absorbed,

and it is hence the interest of the operator to use as much oxygen as possible, instead of the reverse. With regard to the law of the quantity of heat evolved being proportioned to the quantity of oxygen consumed, the following extract from the article "Combustion," in my *Elements of Chemistry*, (now in the press,) will be sufficient to explain it.

"The determination of the quantity of heat produced during the combustion of a given quantity of a combustible substance is a problem of great importance in the arts, as on it depends the economic value of all varieties of fuel. The plan generally followed has been to burn the substance, by means of the smallest quantity of air which is sufficient, in a vessel surrounded, as far as possible, with water. If it be found that the burning a pound of wood heats 37lbs. of water from 32° to 212°, no idea can be thereby formed of the quantity of heat evolved. But if, in another trial, it be found, that the burning of a pound of charcoal raises the temperature of 74lbs. of water through the same range, it follows, that the charcoal has double the calorific power of the wood. True relative numbers can thus be obtained, although they have, independently, no positive signification. The results obtained in this way, by various experimentors, have been exceedingly discordant; but, by the late researches of Despretz and of Bull, a very interesting rule has been obtained. It is, that in all cases of combustion the quantity of heat evolved is proportional to the quantity of oxygen which enters into combination. Thus Despretz found that there are heated from 32° to 212° by

1 lb. of oxygen,	uniting with	hydrogen,	29½	lbs.	of water.
1 ,,	,, ,,	charcoal,	29	,,	,,
1 ,,	,, ,,	alcohol,	28	,,	,,
1 ,,	,, ,,	ether,	28½	,,	,,

giving, as a mean, 28¾lbs. as the quantity of water heated from 32° to 212° by the heat evolved in the combination of one pound of oxygen. This rule, however, is liable to some very curious changes," &c. &c.

Laboratory of the Apothecaries' Hall, Dublin.

INQUIRY INTO THE CAUSES OF THE DIFFERENCE BETWEEN THE CORNISH LIFTING AND CRANK ENGINES. BY MR. W. RADLEY C. E.

Sir,—Observing in a recent number of your Journal a requisition by yourself for some engineer to furnish your pages with an exposition of the discrepancy of result between the Cornish lifting and crank engines, together with an explanation showing in what consists the difference of power elicited, under similar circumstances, by those two modifications of the steam-engine, I take the liberty of communicating to you some ideas on the subject, and also some experimental data, of which some were suggestive of, and others suggested by, these ideas.

Some years ago I conceived the notion of converting the momentum of the steam-driven piston to the purpose of die-sinking for calico printers, by affixing a stuffing-box to the cylinder bottom, for the passage of a punch-socket attached to the piston; and, I found that when the motion of the piston was regulated by a crank and fly-wheel, and allowed to descend *through 11/12ths of its stroke*, ere *coming by means of the punch to a dead set*, I could not produce half the effect obtained when the arrest of impetus took place at half the stroke. The reason of this will be obvious to your readers, without any elaborate explanation.

Some little time after this, whilst observing the motions of a lifting engine, on the Cornish plan, which has a 10-feet stroke, I became acquainted with the fact, that the *motion of the piston was two-fold;* that is, *the down-stroke was a separate and distinct function, perfect in itself*, and the *up-stroke was merely a preparation* for the former, and had otherwise no connection with it. Pursuing my observations a little farther, I found that this engine made nearly six strokes per minute, and that each complete movement occupied, as near as may be, 10 seconds; of these 10 seconds, 5 seconds were occupied by the pause, rather more than 2½ seconds by the up-stroke, and the remainder by the down-stroke.

From these facts it follows, of neces-

sity, that the calculations of Mr. Pilbrow and all others upon this subject must be erroneous; and that in the instance of the Wheal Vor Borlase's engine, quoted by Mr. Pilbrow, (No. 947,) instead of the mean velocity of the piston being stated at $10 \times 5{\cdot}67 = 56{\cdot}70 \times 2 = 113{\cdot}40$ feet per minute, it ought to be $10 \times \frac{60}{2\frac{1}{2}} = 27 = 270$ feet per minute. Now, if we compare this with the developed power of the Cornish crank engine, also quoted by Mr. Pilbrow, whose strokes were 9 feet each, and 8·8 of them in the minute, making about 150 feet per minute, (which Mr. Pilbrow calculates to be only about $\frac{7}{12}$ths of the duty of the lifting engine,) by taking $\frac{270}{12} = 22{\cdot}5 \times 7 = 157{\cdot}5$, we obtain a theoretical result much in accordance with the absolute duty. The higher ratio of the Cornish lift may be safely ascribed to the difference of friction in the two cylinders, one being 84, the other 32 inches; coupled with the difference in number of strokes between the two engines.

I will now subjoin a tabulated view of a comparison betwixt the two engines; only supposing, in order to aid the comparison, that the crank had the same stroke as the lifting engine, viz., 10 feet, and each 6 strokes per second. I have divided the down-stroke, in each case, into 10 equal parts of the crank pin's gyration, equal to one foot of the piston's descent.

Cornish Lifting Engine.			Cornish Crank Engine.		
Time in ¼-seconds.	Velocity of Piston, in Equal Times, expressed in inches.	Portion of Stroke.	Time in ½-seconds.	Velocity of Piston, in Equal Times, expressed in Inches.	Portion of Stroke.
Seconds.	Inches.	Feet.	Seconds.	Inches.	Feet.
¼	9	$\frac{1}{10}$	½	3¾	$\frac{1}{10}$
¼	13	$\frac{2}{10}$	½	8⅝	$\frac{2}{10}$
¼	13½	$\frac{3}{10}$	½	13⅛	$\frac{3}{10}$
¼	14	$\frac{4}{10}$	½	16½	4
¼	14	$\frac{5}{10}$	½	18	5
¼	14	$\frac{6}{10}$	½	18	6
¼	14	$\frac{7}{10}$	½	16½	7
¼	13	$\frac{8}{10}$	..	13⅛	8
¼	12	$\frac{9}{10}$	..	8⅝	9
¼	3½	10	..	3¾	10
2½	120	10	5	120	10

By this table it will be seen, that neither of the two pistons moves through equal spaces in equal times; and that not only is this discrepancy greatest in the crank-guided piston, but that the unguided piston has a higher mean speed.

I will not vouch for the absolute accuracy of all I have here set forth; but, as it is the principle which forms my theme, I crave the indulgence of your liberal and better informed readers.

On what ground Mr. Pilbrow can, under these circumstances, claim any superiority for his engine I am at a loss to conjecture; but I would, before concluding, inquire what is the cause, nature, and real mode of operation of the *pause in the lifting engine?* I think it *can be easily shown,* when the cause is considered, that this function, or absence of function, can contribute nothing to the efficiency of the engine. For, let us suppose there is a vacuum in the condenser, equal to 27 inches of mercury, and that the cylinder at the top of the stroke is filled with steam of 6 inches of mercury; in that case, if the plunge-weight, which is to balance and overcome these forces, is inadequate to the task, then the valve between the cylinder and condenser will not open, and this it is which is the occasion of the pause. As the steam in the cylinder, by the tendency to an equation of temperature, becomes attenuated, the forces productive of the pause give way, the valve opens, and at that instant the piston is in rapid motion. What has been taking place in the condenser in the

hile? Why, a vitiation of the , in consequence of the evolution om the injection water, and other This evolution cannot be rec- r the air-pump during the stroke, of no use for the next; so that, , this much-talked of pause may il rather than a benefit, and may m a due calculation by the en- ker, &c., as to the balance of

I am yours truly,
William Radley.

, January 1, 1842.

COMBUSTION OF COAL AND COKE
RBONIC OXIDE, OR COKE GAS.
. W. WILLIAMS, ESQ.

[In continuation from page 5.]

-In my last week's contribution to agazine I referred to the exist- a combustible gas in furnaces, ad hitherto escaped the attention ical men—was denied by many— bted by most—outside the labora- I allude to carbonic *oxide*. I tted you a letter of a most im- character on this subject, setting le question at rest, not only as the existence of this gas in a or available quantity, but of its pplication in the generation of intense heat.

the most important considera- s regards the conversion of this available purposes, relate to the of air to be admitted in effecting bustion, with the time when and here such admission is rendered ry. I will therefore briefly exa- ese points, as they arise out of sideration of the constituents of , and the circumstances attending ration and combustion.

y treatise On the Combustion of considered it of the last importance l on the nature and properties of arbonic oxide," and the import- providing for its combustion. se points I will, if possible, refer ext. I will now, for perspicuity d for the better consideration of ject in a practical point of view, ish this gas from the other com- gases produced in a furnace, by which, though chemically it may ctionable, yet practically will be o have *its value*.

I will, then, divide the combustible gases, which are to be converted to the purposes of heat in the furnace, into three classes—First, Bi-carburetted Hydrogen; secondly, Carburetted Hydrogen; and, thirdly, Carbonic Oxide. The first two I will call the *coal* gases, and the third a *coke* gas; meaning by the latter term to convey the idea, that the two former are generated in the practical combustion of coal; and that in the process of combustion of the coke, or solid carbonaceous residue of coal, the latter is produced.

Now, with respect to the quantity of air required for the combustion of this carbonic oxide, or *coke gas*, the weight of carbon which it contains being the same as that which went to the formation of carbonic acid, the quantity of air must necessarily be the same, to provide an equal weight of oxygen. But since the carbonic acid, in its conversion into carbonic oxide in the furnace, has doubled its volume, it follows, that the *volume* of air required must be in accordance with this chemical transformation of the acid into the oxide. In other words, that each cubic foot of carbonic oxide, taking the carbon thereof at 6, by weight, will require a volume of air, the oxygen of which will be 8, being one-half that required in the generation of carbonic acid; so that, if the solid carbon of a ton of coals requires 240,000 cubic feet to convert it into carbonic acid, the carbonic oxide generated from such, (supposing it all to be so converted, and which is probably the case in large and deep furnaces,) would be 120,000 cubic feet.

With respect to the time when and place where such air should be admitted—it is clear that this should be regulated by the place where the gas is to be encountered—namely, beyond the bridge; inasmuch, as it is only in the passage from the incandescent fuel in the furnace, and after it has escaped from such fuel, that it can be met. This at once neutralizes the erroneous inference arising out of the supposed absence of a combustible gas, when the "coal" gas has all been evolved; and the supposed injurious effect of air, if admitted at such time. Practically, the existence of this gas is unnoticed by engineers, and consequently, the necessary demand for air denied. When, however, we consider that this "coke gas" is generated when

the "coal gas" has ceased to exist; and that its quantity is in proportion to the quantity and incandescence of the ignited fuel on the bars, we shall see that the demand for air for the former will arise in the same rate and degree as that for the latter shall have ceased. Thus this demand is in admirable harmony with nature's uniformity in the supply of air, and relieves us much from the supposed inequality in the demand in furnaces, arising out of an unequal generation of combustible gases. In searching for the reason why the existence of the "coke gas" has been overlooked in practice, and the demand for air denied—this can easily be accounted for as regards close furnaces, from these circumstances: 1. That until it has been converted into flame, it is necessarily invisible; and, 2. That the place where it is so converted, is beyond the reach of observation—being beyond the bridge, to which part there is no usual access or means of seeing what is going on. In smelting furnaces, or in all operations where this gas arises in large quantities and meets the air at its exit from the top, it is strange that it should have been so long neglected, and that coke, which it is asserted burns without flame, should yet be attended with so large a body of it, without exciting attention to its heating powers, and the causes and circumstances under which the body of unquestionable flame is generated from a fuel which is said to burn without it. I propose continuing this subject in my next communication.

I am, yours, &c.

C. W. Williams.

Liverpool, January 4, 1842.

PATENT SOLAR LAMP.

Sir,—Our attention having been drawn to a letter in your publication of the 18th instant, headed "The Cap or Deflector Lamp, commonly called the Solar Lamp," and signed "A Constant Reader," in which letter our names are made use of, we shall be obliged by your inserting this communication in your next number.

It is generally known, that we are the proprietors of the patent right of the Solar Lamp, and "A Constant Reader" is evidently aware of this fact; the manifest object of his letter being to lead the public to suppose that the solar lamp is one of Upton and Robert's contrivances.

All that we think it necessary to state is, that we have some time since commenced an action, which is now pending against the same Mr. Upton, whose name is here mentioned in connection with Roberts (who is since dead,) for infringing our patent rights in the solar lamp, by selling a contrivance called "Young's Patent Oxydator;" and on the trial of that action, he will have a much better opportunity of showing whether the solar lamp is one of Upton and Roberts's contrivances, than can be afforded in any other way.

It is not our intention to be drawn by Mr. Upton, or his friend, "A Constant Reader" into a correspondence on the merits of the question between him and us, but we think it desirable, that the public, to whom "A Constant Reader" has addressed his observations, should be aware of the real state of the matter, and that we are at this moment taking against Mr. Upton the same course which we have already pursued against other parties who have infringed our rights, by seeking damages against him by legal proceedings.

Trusting to your sense of justice for the insertion of this letter, we are, Sir,

Your obedient servants,

Timothy Smith and Sons.

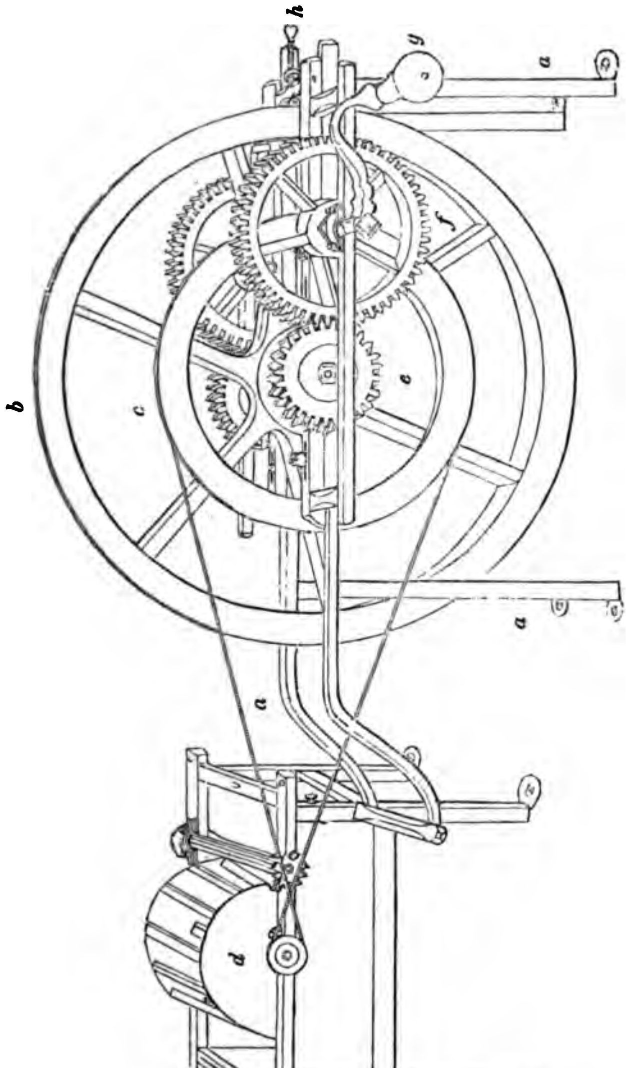
Birmingham, December 29, 1841.

PLOWMAN AND QUARTERMAN'S MANUAL POWER FOR THRESHING MACHINES.

(Registered Pursuant to Act of Parliament.)

In our last volume (page 504) we published a description of a new "Horse power" for threshing machines, designed by Messrs. Plenty, of Newbury. The accompanying engraving represents a new "manual power" adapted to similar machines recently introduced by Messrs. Plowman and Quarterman of Oxford. It consists of two horizontal bearers mounted upon suitable supports *a a*; upon these bearers a sliding frame is placed, which carries the bearings of the several axles. The centre of the frame is occupied by a large fly-wheel *b*, which carries a drum *c*; upon the prolonged axis of the fly-wheel a small spur wheel, or pinion *e*, is placed upon each end, which pinions revolve in the outer compartments

or wings of the sliding frame. In suitable bearings, immediately behind, and gearing into the former, two large spur wheels, *f*, are placed, furnished with winch handles *g*. On turning these handles a rapid motion is given to the fly-wheel and drum, which is communicated to the threshing-machine by a belt



from the drum passing round its pulley *d*. —At the end of the bearing frame there is a screw *h*, working through a fixed collar, and taking into a *nut on the upper* sliding frame; by turning this screw to the right hand or to the left, the upper frame is made to slide backwards or forwards upon the lower, and by this means

the band, or belt is kept constantly tight.

The performance of one of these machines on the large scale, has given the highest satisfaction to competent judges, and it appears well adapted to supply a desideratum in many agricultural localities, — advantageous employment for willing able-bodied men during the cessation of profitable out-door labour.

A TRIP IN THE "ARCHIMEDES."

(From the Bristol Magazine.)

Dear Mr. Editor,

On presenting your note of introduction to Mr. Smith, the morning of the departure of the *Archimedes*, from Bristol, I was very kindly welcomed on board, and having ascertained that the steward's arrangements would not be disconcerted by an extra hand at the *mess*, at which I undertook to perform my share of the duty without skulking, I soon felt myself as much at home as if I had been quartered on the beef and pork for a voyage to the East Indies.

Our party consisted of Mr. Smith, the inventor of the screw, in *propria persona*, a gentleman friend of his (who was disposed to go "a pleasuring," like myself, to enjoy the inviting breezes and invigorating fogs of an honest old-fashioned November, on "the broad, the open sea"), the Captain, the managing engineer, Mr. Ray the pilot, and your humble servant, all, with perhaps one exception, practical fellows, able to look a nor'-wester in the face without winking; and when the hauser was let go off Rownham, at exactly half-past ten A.M.,—for my own part, I felt ready for anything, from "pitch and toss to manslaughter."

You will remember that the morning of the 20th November came in fine and soft, and as I was going down to the *Archimedes* from the city, I was apprehensive that the run round to London would be a very dull and common-place affair, affording but small opportunity of testing the properties of the screw, more than could be done in a river. By the time, however, that we reached Kingroad it was piping up pretty fresh from the south-west, and when we rounded Posset Point, exactly one hour from the Basin, it was blowing hard right a-head, and as it looked black and murky to windward, I began to entertain hopes that I should have something to say to you ere we reached London.

The wind continued to increase as the day advanced, and when we reached the Holmes, at two o'clock, it was blowing a whole gale, and Mr. Ray, calling a council of war, represented, that as we should soon have the whole flood tide to contend with, during which it was not to be supposed that any vessel, against such a wind, could make much progress, and as it was necessary to husband the coal, of which we had only a limited quantity, he would advise our running into Pennarth, and seeing how it would be on the next ebb, as he was sure it would be "nothing but a real dirty night." This advice was adopted, and we let go our anchor in Pennarth Roads at half-past two o'clock, four hours from the time of leaving Bristol Basin, the last three of which it had been blowing very hard against us.

The justice of Mr. Ray's observations was soon established; for shortly afterwards the *Victory* and the *Bristol* bore up and came into the roads also, both vessels anxious to make good their time, and the latter with only a short distance (to Swansea) to run. The next morning (Sunday) it was blowing still very hard, with very unsteady wind, veering about from south-west to north-west, and the pilot still discountenanced our getting under weigh. The *Victory*, however, made another attempt, and succeeded, as I have since learned, in getting so far as Milford in the next twenty-four hours; but the *Bristol* remained, as well as ourselves, until the Monday morning, when, the wind having abated, though still westerly and fresh, we weighed anchor, resolved to take a final leave for that voyage of Pennarth, which we did exactly at twenty-five minutes past seven, in company with the *Bristol*.

At eight o'clock, hove the log, and found her going seven knots, wind west south-west, very fresh, engine making twenty-four revolutions per minute. At noon, strong winds and rainy weather. Half-past twelve, abreast of the Foreland, strong gale and heavy sea, and the *Bristol* we observed bearing up again for Cardiff (where, I have since understood, she landed her passengers); as, however, we were doing well, we kept on without the slightest deviation from our course till we reached Lundy Island, under which we anchored, at a quarter after seven the same evening, the wind continuing to blow a strong gale from west north-west to west. We accomplished the whole distance from Cardiff to Lundy at the average rate of five miles an hour, against such weather and a whole flood tide; Mr. Ray, the pilot, and several of the hands being perfectly astonished at the ease with which a true course was steered in weather in which, he asserted, many large and powerful steamers could not have been kept head to wind at all.

We lay at anchor, under Lundy, all that night and part of the next day, during which I got on shore to visit *the natives*. There

are, it seems, only thirty inhabitants on the island, apparently a healthy and a happy little colony; they told me, such a thing as a doctor on the island had never been heard of. Two, at least, of the lot are both pretty and agreeable, I can say that from my own observation, (this, of course, is not a part of "the log;") but as I suppose you want an account of the *Archimedes*, and not of Lundy Island, I proceed to inform you that, at about noon, on Tuesday, the 23rd of November, the wind hauled so far to the northward, as to admit of our setting the canvass, and we got under weigh at one o'clock P. M., a tremendous sea still tumbling into the chops of the Channel, from the westward, on account of the previous heavy gales from that point, notwithstanding which we found her going eight and a half knots by the patent log. At six the wind had become so strong, that we took in the main spencer. At eight, a heavy squall struck us, and blew away the jib; at half-past eight, a heavy gale and head sea, speed by log six and a quarter knots. I was never more pleased, myself, than when I came on deck in the midst of this hubbub, to see how beautifully this little vessel was performing her part; at this time she was making good six knots, with a terrible head sea on, and blowing too hard to carry any canvass. She was *making excellent weather*, and a boy might steer her; and, from first to last, the engine never varied above three or four strokes per minute, at no time exceeding twenty-five, nor being down so low as twenty, the whole voyage. This, to me, appeared the more singular, as I had observed such a striking difference in the action of the paddle-wheel engines, at different times, which labour dreadfully in a heavy head sea, and are liable to *run away* when scudding in similar weather, requiring to have the steam *shut off*, on account of the paddles being sometimes wholly out of the water. I have known the mighty *Western* reduced down to five strokes per minute, and even less, by the strength of the opposing wind and sea, though, when doing her best, she makes sixteen and seventeen strokes per minute. Talking of the *Great Western*, by the by, puts me in mind of the first gale of wind I experienced on board of her. At the time I speak of, the people were getting the yards down, and I was on the spar-deck, forward, lending a hand, when two or three seas, successively, slapped in over us, almost taking my breath away, and scarcely giving me time to recover it again; one of the hands, an old whaler, who stood near me, however, said to me, quite coolly, "Hold on, and never mind her, sir—she'll come up to blow presently;" thus identifying her, as a sailor delights to do, with a thing of life and habits.

At half-past eleven at night we made the Longships; at midnight, very heavy squalls, with rain and hail. Rounded the Longships at about half-past three in the morning, and ran up the Channel all that day, at the rate of about nine knots. At half-past two in the morning of Thursday, we met a strong breeze from the eastward, notwithstanding which we were off Beachey Head by eight, when we sent down the gaffs and fore-yard, the wind continuing against us till two P. M., when it abated, and shortly afterwards fell calm. At half-past two, we hove-to off Sandgate for a couple of hours; and at seven, anchored in the Downs, after a run of thirty-seven hours' steaming from the Longships. Here the weather was quite calm, but very thick, and we remained at anchor until the following morning. On Friday morning, at six, got under weigh, and, though constantly delayed by a dense fog, we were at Gravesend by four in the afternoon, and safely moored at Blackwall by half-past six on the same evening, (Friday, Nov. 26,) in six and a quarter days from Bristol, only three days nine hours of which we had been absolutely under weigh, accomplishing a distance of over six hundred miles, about half of which was against strong head winds and a heavy sea.

I don't imagine that the above needs any commentary, Mr. Editor. All I know is, that we passed every sailing vessel and steamer we fell in with between Bristol and London, and accomplished the voyage without unpleasantness of any sort, saving the weather alone. The vessel performed her work with uniform regularity, and every one on board was delighted with her; and if you have a doubt on any point, I refer you to Mr. Ray, the pilot, from whom Mr. Smith took a certificate of her behaviour during the severe gales in the Bristol Channel.

It should be borne in mind that the *Archimedes* is a vessel drawing eleven feet of water, and that she has little more than one-horse power to every four tons register; and I do not believe there is in the kingdom a paddle-wheel steamer, of the same proportion of power to tonnage, and the same draft of water, that would have *a chance* with her against a strong wind and heavy sea. At any rate, I am sure there is not one that I would be so well pleased to be on board of in such weather; nor need you fear saying too much in favour of an invention, which is only kept from general adoption, either because it is unknown, or because people do not desire to know it. It is to me a complete puzzle; nor can I account for the indifference with which the steam-navigation world appears hitherto to have regarded it,—so superior as it is, in every respect, as

far as my experience goes, to the mode of propelling vessels by side paddle-wheels.

Depend upon it, Mr. Editor, the *Great Western* Company know what they are about. It is no speculative point of questionable advantage upon which the excellence of the *screw propeller* rests; it is a strikingly superior, as well as an entirely new, invention. Propelling vessels by side paddle-wheels, (though not perhaps by steam,) is as old as the pyramids; but it is left to the *screw propeller*, I firmly believe, to exhibit the real triumph of steam and modern skill on the ocean, over every thing that was ever dreamt of before.

I am, dear Sir, yours truly,

TOM CRINGLE, Jun.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for that purpose.*

EZEKIEL JONES, OF STOCKPORT, MECHANIC, *for certain improvements in machinery for preparing slubbing, roving, spinning, and doubling cotton, silk, wool, worsted, flax, and other fibrous substances.* Enrolment Office, December 10, 1841.

The first of these improvements is applied to the roving machine, commonly known as the bobbin and fly frame, generally employed for producing the finer rovings, and is designed to obviate the uncertain rotation which occurs in the usual mode of conveying motion by means of the cone and strap.

The second improvement consists in a method of regulating the varying speeds of the bobbin and flyer, so that each succeeding layer may be placed with equal tension, and in regular succession during the filling of the bobbin, from the commencement of the bare spool to its greatest diameter when full.

Another movement is designed to regulate the distribution of layers on the surface of the spool or bobbin.

EDWARD PALMER, OF NEWGATE-STREET, GENTLEMAN, *for improvements in producing printing surfaces, and in the printing china, pottery ware, music, maps, and portraits.* Enrolment Office, December 12, 1841.

The first of these improvements consists in obtaining printing surfaces on copper, or other metallic or conducting surfaces, by the known power of electrotype, in the following manner. A composition is first made of two parts white wax, two parts lard, and one part of ivory black or lamp black; these ingredients are boiled together, and, when cold, ground to a proper consistency for painting with olive oil.

A plate of metal, of proper dimensions, is then taken, and the subject required drawn upon it, and submitted to the electrotype process.

The second improvement consists in a mode of obtaining metallic plates with raised printing surfaces, by means of which china, music, maps, &c., may be printed. This process closely resembles the former, but in this case, instead of the black composition, a white one is employed, composed of two parts wax, two parts lard, and one part sulphate of lead.

ROBERT ORAM, OF SALFORD, LANCASTER, ENGINEER, *for certain improvements in hydraulic presses.* Petty Bag Office, December 12, 1841.

These improvements consist in a simple addition for the purpose of causing the ram to move with greater speed, when light articles are being pressed, until a point is attained when the full power of the machine is required.

For this purpose, a small stationary ram is inserted through the bottom of the water cylinder, into the common ram, which is bored to receive it, and is thus converted into a second cylinder. The interior of the ram may be a cylinder of four inches diameter only, while that of the water cylinder is ten inches; water is, therefore, in the first instance, pumped into the interior of the ram, until the utmost pressure is obtained; the water is then pumped into the ordinary cylinder, when the speed becomes diminished, and the power proportionately increased, say in the ratio of 16 to 100.

There is a provision for admitting water to flow into the outer cylinder, to occupy the vacuum which would otherwise be occasioned by the ascent of the ram.

The claim is to the boring out of the ram to convert it into an interior cylinder, and the introduction of the smaller stationary ram into the same, in order that the strokes of the pump may tell quicker upon the goods under pressure.

JOHN HAUGHTON, OF LIVERPOOL, CLERK, MASTER OF ARTS, *for improvements in the method of affixing certain labels.* Enrolment Office, December 18, 1841.

This invention has reference to the penny and two-penny new postage labels, and its essential peculiarity is said to be, the placing a letter in a machine which contains a liquid and suitable apparatus for damping, and causing such a motion to a part of the machine, that the liquid shall be brought into contact with the letter, so as to damp the precise fitting motion. And so placing labels and a letter, respectively, in a machine, as to be able to communicate such a motion, that

:l shall be brought into forcible contact the letter, and be affixed to the exact on of it previously damped. The disve principle of this invention may, it is be variously carried out, and three of apparatus are described at great h. The first is a small machine, called *nper*, in which the upper right-hand r of the letter is inserted and damped; econd is the *stamper*, in which the letter ously damped is brought in contact with tage label, properly disposed, which bes fixed thereunto by pressure communito the upper part of the apparatus. her form of apparatus, called a *labeller*, rms both the damping and stamping ss.

ILLIAM PETRIE, LATE OF CROYDON, NOW OF CONDUIT-STREET, gentleman, *mprovements in obtaining mechanical r, which are also applicable for obg rapid motion.* Enrolment Office, mber 18, 1841.

ese improvements consist in the application of the differential pulley or Chinese lass, by means of a system of internal ential gearing to cranes, windlasses, ans, &c.

the terminating crank of an axle are d two toothed wheels fastened firmly her or made in one piece, both being to revolve together on the crank. One ese wheels is larger than the other. The ler wheel revolves in a fixed internalled wheel, supported externally with its e in a line with the axle, its interadius being equal to that of the small wheel added to the length of the crank. larger wheel revolves within another ed wheel fixed by its centre at the extreof a removeable axle which lies beyond rank, in a straight line with the cranked so that the internal wheel lies flat ist, but does not quite touch the fixed nal wheel. The internal radius of this l (which is called the resistance wheel,) qual to that of the large crank wheel d to the length of the crank. An ordibarrel is placed upon the axle of the tance wheel for winding up a rope, chain,

When the cranked axle is made to re-, the resistance wheel will revolve with er power, and consequently slower, ided that *double the length of the crank, iplied by the difference between the eter of the small and large cranked ls*, be less than *the diameter of the tance* wheel multiplied by the diameter he small crank wheel. The patentee is the combination of two wheels of difit diameters on a crank, and working two corresponding *internal wheels*, so *d, that one being fixed,* the other will *e in the manner described.*

The advantages of this contrivance over the ordinary system of gearing, are stated to be its greater compactness, the unlimited power obtainable by only two moving points besides the axle to which the moving force is applied, and the necessity for very few bearings; and hence its superior simplicity and lightness when great power is required, the whole force being obtained in the space generally allowed for a single wheel.

THOMAS WALKER, OF NORTH SHIELDS, ENGINEER,' *for improvements in steam-engines.* Enrolment Office, Dec. 18, 1841.

The patentee states that the object of his improvements is to prevent the exhausting steam of one cylinder, from interfering with the other cylinder while in full power, as he conceives that when the steam of one cylinder is exhausting it will pass through the eduction pipe to the other cylinder where it is not wanted, and destroy, in a measure, the power of that cylinder for a time (the quicker the engines goes, the greater will be the resistance to each piston alternately by the other's exhausting steam); to avoid this, the patentee uses separate exhausting ways, and so prevents the exhausting steam of one from interfering in the least with the others.

We really know not which to admire the most, the extreme *simplicity* of this invention, or, the brevity of the specification, of which the above is not an *abstract*, but a *copy*.

In the drawing accompanying the specification, the two cylinders of a locomotive engine are shown, each having its separate exhaust-pipe proceeding into the funnel.

JOSEPH GAUCI, OF NORTH-CRESCENT, BEDFORD-SQUARE, ARTIST, AND ALEXANDER BAIN, OF WIGMORE-STEET, CAVENDISH-SQUARE, MECHANIST, *for improvements in inkstands and inkholders.* Enrolment Office, December 21, 1841.

The first of these improvements consists in placing a small force-pump at the bottom of the interior of the inkstand, the piston of which is raised or depressed by means of a screw, or other suitable contrivance; when the piston is at the top of the working barrel, the ink flows into it through small openings made in its side for that purpose, which ink, on the descent of the piston, is forced up a tube into the inkholder, or dipping-place. In a second modification, the piston-rod works through a stuffing-box in the closed top of the pump-barrel, and raises the ink in its upward movement. In a third modification, the pipe leading perpendicularly from the inkholder forms the piston-rod, the piston being affixed to its lower end, and working in a well at the bottom of the inkstand.

A second improvement consists in for-

ing the inkstand of a horizontal cylinder, with a projecting spout or dipping-place on one side. When in a position for use, the ink flows into the dipping-place; but when done with, the inkstand can be turned on its axis, the whole of the ink flows back into the interior, and the spout rises up against an ornamental stop, which closes the orifice, preventing evaporation of the ink, or collecting of dust. In another arrangement of this inkstand, the front is a circular glass plate, with a dipping-place, which turns in a fluid-tight joint, and allows the dipping-place to be raised up against the stop, as before, while the main body of the inkstand and its contents remain stationary.

The claim is, 1. To a mode of constructing inkstands by applying a force-pump below the surface of the ink, in the vessel containing the ink; 2. To a mode of constructing inkstands by causing the ink vessel, (or part thereof,) containing ink, to move partly round, and, by the gravitating property of the ink, to supply ink to an inkholder for use.

John Lee Stevens, of King Edward-street, Southwark, General Agent, and John King, of College-hill, London, Printer, *for certain improvements in candlesticks, and other candle-holders.* Enrolment Office, December 23, 1841.

These improvements consist in raising the piston or plate, on which the bottom of the candle rests within the socket of the candlestick, by a spiral motion. In some cases, a screw thread is cut upon the prolonged stem attached to the piston; in other cases, a thread, on the periphery of the piston itself, works in a spiral groove within the socket.

A gradual vertical motion is thus given to the piston by means of a screw, instead of being raised, as heretofore, by the direct pressure of the finger. Several different modifications of arrangements for this purpose are shown.

The claim is, 1. To the application of an internal and an external screw, for the purpose of causing a vertical movement on turning the nosel; 2. To the raising the piston, or candle, by means of a spiral screw working within a tube or collar, as described.

Robert Stephenson, of Great George-street, Westminster, Civil Engineer, *for certain improvements in the arrangement and combination of the parts of steam-engines of the sort commonly called locomotive engines.* Rolls' Chapel Office, December 23, 1841.

The first of these improvements relates to the disposition and arrangement of the wheels of six-wheeled engines, and consists in disposing the axis of the hinder wheels beneath the hindmost end of the cylindrical part of the boiler; the said axis passing horizontally across in front of the foremost end of the fire-box, instead of behind the hindmost end thereof. But the straight axis of the foremost wheels is disposed as usual, or nearly so, that is, horizontally across beneath the foremost end of the cylindrical part of the boiler, so as to be beneath the stuffing-boxes of the steam cylinder. The cranked axis of the main or propelling wheels is disposed horizontally across, beneath the cylindrical part of the boiler, at a suitable place in the interval between the foremost and the hindmost axles; such interval being that usually observed in six-wheeled engines. In a locomotive engine constructed agreeably to this improvement, the boiler will be longer than in the ordinary six-wheeled engines, and its evaporative powers proportionably increased.

The second improvement is equally applicable to both four and six wheeled engines. It relates to the position of the slide-valves, steam-chest, &c., and consists in placing the slide-valves in vertical planes at the sides of the steam cylinders, so that the direction of the sliding motion of such valve, and the central line of each valve-rod, will intersect the central line of the main axis of the crank at the point where the eccentric is placed. In this case the eccentric rods are joined directly to prolongations of the valve-rods, without the usual intermediate levers or axes; and one steam-chest, placed between the two cylinders, contains the slide-valves belonging to each.

The third improvement relates to a method of working the feed-pumps for supplying the boiler with water, and is applicable to all engines having two sets of eccentrics for working the slide-valves; it consists in jointing the piston-rods of the two feed-pumps to the half-hoops belonging to the eccentric rods, which are only used to work the slide-valves when the motion of the engine is reversed; so that the short reciprocating motion of these two eccentrics works the feed-pumps and keep the boiler supplied with water.

RECENT AMERICAN PATENT.

[From the *Franklin Journal.*]

Curled Hair Carding Machine, *Francis Harding.* Upon a cylinder about 2 feet in diameter, and similar to the cylinder of a carding machine, slats are attached, which are about 2 inches in width, and 4 inches apart—these slats are covered with cards having two or three rows of strong wire teeth set in stout leather, and bent, or hooked, forward. Over the cylinder, attached to arch pieces, are six stationary

slats, provided with teeth similar to those on the cylinder, but with the hooks turned the reverse way. These slats are connected with the arch pieces by means of springs, so as to give them some play; the teeth on these slats are of the same kind as those of the cylinder, but they are less and less coarse as they recede from the feed apron and approach a brush cylinder, which is opposite a feed apron, by which the machine is supplied.

The claim is to the combination of the stationary and revolving cards, arranged, constructed, and operating as described, and in combination therewith the revolving cylinder of brushes, each brush consisting of a single row of bristles.

The difference between this machine and the carding, or heckling, machines, previously in use, will be manifest from the fact that neither of these machines would perform the operation of picking curled hair; whatever similarity there may be between them, it must be plain that they are by no means identical.

THE LATE GREAT WESTERN RAILWAY ACCIDENT.

We are informed, and have reason to believe, that we made a mistake in stating, in our last number, that, "just before the starting of the very luggage train that met with the late disastrous accident, the propriety of placing the passengers next the engine and tender" had been fully discussed between the three principal officers of the railway, the engineer, secretary, and superintendant; and that Mr. Brunel represented, at the inquest on the bodies of the sufferers, that the passenger truck had, on that occasion, been actually placed "in the middle of the train." The luggage-train to which Mr. Brunel alluded was, it appears, that of the evening, or rather morning, *following* the accident. We were led to refer Mr. Brunel's statements, to the luggage-train which actually encountered the accident, from a confusion which prevails as to the times spoken of, in the newspaper reports of the evidence given at the inquest, from which alone our information was derived.

To the question, "Whether any means were provided *for enabling the carriages to sustain, without damage, any collision* which might happen to them?" we remain, and, we fear, are likely ever to remain, without any distinct and satisfactory answer. We believe the only *true* answer that can be given is—*none whatever*. Neither on the Great Western Railway, nor on any other which we know of, has any thing like adequate attention been paid to the protection of passengers from the *consequences* of collisions. Such care as railway directors, managers, and engineers have hitherto taken to provide for the safety of their customers has been almost solely directed to the *prevention* of such accidents—it being taken too much for granted, on all hands, that, when they do occur, some slaughter, more or less, is inevitable. And yet, most certain it is—unless we are to abandon all faith in the resources of science and art—that means may be found to render innocuous the worst collisions which can happen on railways, in the course of their ordinary traffic. It is more a question of expense to the Companies, than any thing else; but the expense of such a system of buffers as we recommended in our last would not be great; and were it even ten times greater than it is likely to be, that ought to be no reason with any company for refusing to adopt it.

NOTES AND NOTICES.

The Smoke Nuisance.—A public meeting is to be held on the 12th of January, at the Music Hall, in Leeds, for the purpose of considering the propriety of adopting some course by which the smoke issuing from the various steam-engines which abound in that neighbourhood can be burnt or prevented. The Hall is to be open on two days preceding the meeting for patentees or other inventors, in priority of application, to arrange for exhibition models, plans, sections, or diagrams, and it is arranged (that the whole question may be thoroughly considered) for each inventor to have an opportunity of briefly explaining his apparatus. Questions may be asked in explanation, but it is not intended to allow the inventors to question each other in public, because such course might lead to personal remarks. W. Beckett, Esq., M.P. for Leeds, has promised to take the chair.

Remarkable Magnetic Disturbance at the Greenwich Observatory.—On the 25th of September last, a most extraordinary disturbance of the magnetic instruments was noticed at the Magnetic Observatory attached to the Royal Observatory of Greenwich. Within eight minutes of time the declination needle changed its position more than 2½ degrees (having passed in both directions the range of the observing telescope, which includes the angle), the vertical force was increased by more than 1-40th of its whole value, the instrument having then reached the extremity of its range; and the horizontal force was increased about 1-30th of its whole value. During the appearance of an aurora on the morning

when the needles were in an agitated state, the declination needle in less than three hours traversed an arc of 34 minutes. At 2 o'clock p.m., Gottingen mean time, it was evident that all the needles were affected by some unusual cause of disturbance; and from this time to the discontinuance of the observations (some hours) two persons were constantly engaged, one taking the observations with the vertical force magnetometer, the other those of the declination needle and of the horizontal force magnetometer. The day (September 25) was cloudy throughout; about 9 h. p. m. a few bright streamers were seen through the clouds, then nothing more till 11 h. p. m., when an auroral arch, about 24 degrees high, was visible for a short time.

Ancient Stocking Frames.—A very singular lot of frames was offered lately by auction, consisting of a number of frames from Godalming, in Surrey. many of them are more than 120 years old. Among the rest we were sorry to observe the celebrated frame "Magog," the widest stocking frame in the world, it being 54 inches on the needles. This giant of a frame was built by Mr. Horton, the noted patentee, in London, about the year 1777. It was originally a knotted frame, and was calculated to make silk breeches, then in the height of fashion. About the year 1790, Mr. Horton being a partner, it was removed to the Keeley factory, Godalming, where it made fleecy blankets and great-coats until the year 1838, a period of 48 years. So great was the width, that the London giant frightened all the Nottingham purchasers, and there was never a bid for poor old "Magog." When this is known "half Godalming will be in tears," as he is known to be a "reg'lar good'un." The sale of these frames shows the vicissitute of human affairs. Though the stocking frame was invented at Calverton, yet stocking frames were worked in Godalming before they were in Nottingham, as in 1665 there was only one shop in this place. In the reign of Anne, there were nearly as many stocking frames in Godalming, Guildford, and 17 villages around, as in London.—*Nottingham Review.*

Invention of the Steam Engine.—M. Delecluze has lately made a discovery among the manuscripts of Leonardo da Vinci, carrying back a knowledge of the steam-engine to at least as far back as the 15th century. He has published in the *Artiste* a notice on the life of Leonardo da Vinci, to which he adds a fac-simile of a page from one of his manuscripts, and on which are five sketches with the pen, representing the details of the apparatus of a steam-gun, with an explanatory note upon what he designates under the name of the "Architonnerre," and of which note the following is a translation:—"Invention of Archimedes. The Architonnerre is a machine of fine copper, which throws balls with a loud report and great force. It is used in the following manner:—One-third of this instrument contains a large quantity of charcoal fire. When the water is well heated, a screw at the top of the vessel which contains the water must be made quite tight. On closing the screw above, all the water will escape below, will descend into the heated portion of the instrument, and be immediately converted into a vapour so abundant and powerful, that it is wonderful to see its fury and hear the noise it produces. This machine will carry a ball of a talent in weight." It is worthy of remark, that Leonardo da Vinci, far from claiming the merit of this invention for himself, or the men of his time, attributes it to Archimedes.—*Galignani's Messenger.*

Rifles Inferior to Plain Muskets.—Mr. Greener, the author of an excellent Treatise on Fire-arms, affirms that "the supposed advantages of the rifle exist more in imagination than in reality." (*Times, Dec.* 20.) "A well-constructed cylindrically-bored barrel will," he says, "project a ball further than the best rifles; under the same circumstances, fully 100 yards further, and that with only a very trifling addition of elevation. The disadvantages of the rifle, as a military arm, are very numerous, and it can only become useful in the hands of a man well skilled in its use; and it is, for this reason, unfit to be placed in the hands of a body of men of indiscriminate ability. So convinced am I of this, that I would undertake to teach any number of men, taken promiscuously from a regiment, to contend, with a well-constructed musket, against any similar number armed with the best made rifle yet produced, quickness and accuracy combined."

Introduction of the Hot Blast in Plymouth Dockyard.—Great improvements have been made in the north smithy of this dockyard, in superseding the blowing machines by the introduction of the fire blast, worked by steam-power. All the old bellows are removed from the fires or forges; air pipes, conveying the blast produced by the fans, are fitted in their places, and the working of the fans has commenced. The building, in which are the fans and the steam-engine that drives them, is erected without, adjoining the smithy. The air-drains or tunnels, into which the air produced by the motion of the fans is forced, are dug out of the solid rock, and are carried along through the shop, under the surface of the floor at the backs of the forges, where openings are cut, and pipes introduced to convey the air to the fire. The principle of generating the blast, and its practical utility, have been proved to be far superior to the old method in every respect; for, by the continual and steady blasts of the fan, the heats are much more quickly produced than by the blast of the bellows; consequently, the heats in the course of the day are more numerous, and the metal in heating and forging does not diminish so much. A great saving, therefore, is effected in labour and material, and nearly double the quantity of work can be performed with more than the former facilities. The air-pipes occupy almost as small a space as the noses of the old blowing machines, thereby affording valuable room for additional forges, which the increasing manufacture of anchors at this smithy, and the extra quantity of work capable of being performed, have rendered necessary to be erected, and which could not have been built, had not the old bellows been removed. It was feared that much annoyance would be experienced from the noise of the vibration, caused by the immense velocity at which the fans are driven, which is said to be productive of great inconvenience in other similar constructions. Precautions were taken to prevent this. The fans are enclosed in the smallest possible space by walls; and this, with the solid foundation on which the building stands, and its permanent construction, has had the desired effect, so that not the least noise produced by the working of the fans and engine in this building can be heard in the smithy.—*Times.*

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HENSON'S PATENT CONDENSING STEAM-ENGINE.

Fig. 1.

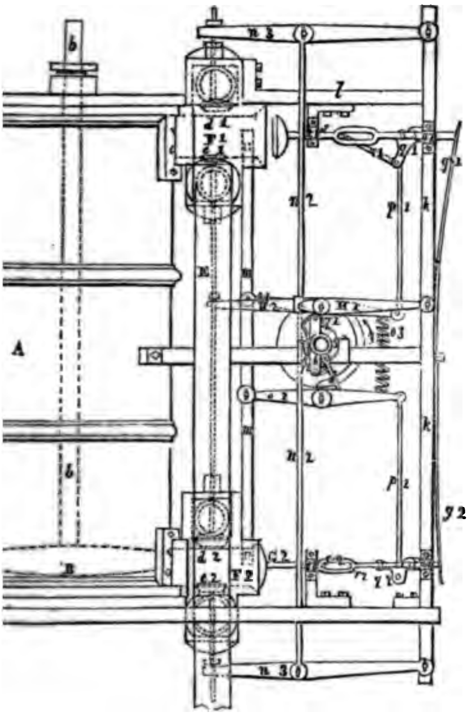


Fig. 2.

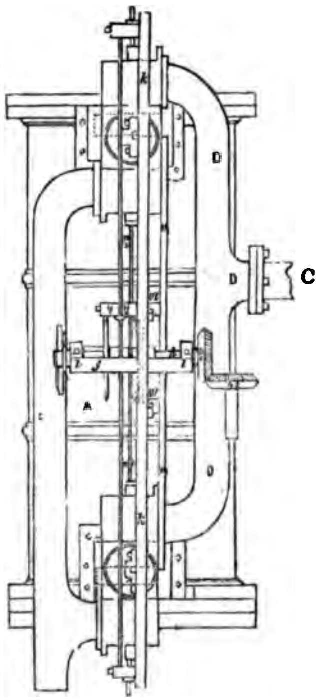


Fig. 3.

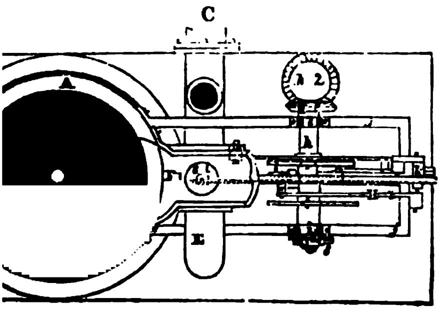
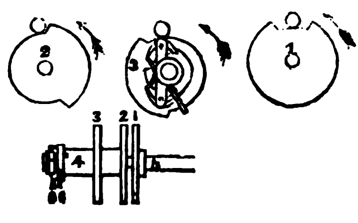


Fig. 4.



HENSON'S PATENT CONDENSING STEAM-ENGINE.*

Description by the Inventor.

The improvement by which this engine is distinguished from others, consists in permitting the escape from the cylinder, or from the steam passages between the cylinder and the condenser, during a very short interval of time near the termination of each single stroke of the engine, of so much steam as shall leave the remainder in the cylinder but little above atmospheric pressure, and condensing that remainder by the means ordinarily used in condensing engines.

Fig. 1, represents a front view of a steam-engine cylinder, with apparatus attached for working the common valves as well as that required for the peculiar purposes of this invention. Fig. 2 is a side view: and fig. 3 is a horizontal plan of the same. Fig. 4 exhibits separately the cams which are shown in connexion with other parts by the figures 1,2, and 3.

A is the cylinder of the steam-engine.

B is the piston, and *b* the piston rod.

C is the steam pipe leading from the boiler.

D is the induction pipe.

E is the eduction pipe, understood to be continued as usual to the condenser.

d 1 and *d* 2 are the induction valves.

e 1 and *e* 2 are the eduction valves.

F 1 and F 2 are the chambers through which the steam pipes communicate with the cylinder; and respecting which I would remark, that I prefer that the openings from them into the cylinder, and the chambers themselves, should be larger than usual.

G 1 and G 2 are the escape valves; they cover corresponding openings in the chambers F 1 and F 2, by which part of the steam escapes into the atmosphere, according to the design of my invention.

g 1 and *g* 2 are springs which assist the return of the valves G 1 and G 2 to their seats.

Having now indicated the principal parts of the apparatus, I will point out their movements; and in so doing I shall always suppose that the steam used is considerably above atmospheric pressure. During the greater part of the downward stroke of the piston B, the upper escape valve G 1 is held firmly to its seat by the action of parts to be described hereafter. When the piston has nearly reached the end of its stroke, the pressure is removed from the valve G 1, on which the excess of the pressure of the steam in the cylinder, over that of the atmosphere, opens the valve; and so much steam escapes as that the pressure of the remainder is equal to that of the atmosphere, together with the force of the spring *g* 1; the valve G 1 then closes, and the eduction valve *e* 1 is opened, which admits the remaining steam to the condenser, and a vacuum is formed in the cylinder in the ordinary manner of condensing engines. In the upward stroke, the corresponding parts perform similar functions, as will be readily understood. By this means, the pressure of the atmosphere is removed from the side of the piston opposite to that on which the steam acts, which has not ordinarily been done in steam engines worked with high pressure steam. The movements of the valves above described are effected in the following manner by the parts I now describe. *h* is a shaft connected by the wheels *h* 1 and *h* 2, or in any other convenient manner, with the main shaft of the engine, so as to make equal revolutions with it. *i i*, are the bearings in which the shaft *h* turns; *j j* bars of the frame supporting the said bearings, and which are themselves secured by one end to the cylinder A; and by the other, to the upright, or standard, *k k*. *k k*, is an upright or standard affixed near its lower end to the base plate of the engine; and *l* is a stay by which the upper end of *k*, *k* is firmly held in its place; *m* is a bar secured to the steam chests F 1, F 2, for supporting the centres of the levers *o* 1, *o* 2. H 1 and H 2 are two levers, whose centres are in one line, and are supported by the upright *k*. H 1, the shorter of these, carries a truck or roller, which applies to the cam No. 3. H 2, the longer lever, carries a similar truck, which applies to the cam No. 2; *n* 1, *n* 1, is a rod which passes through stuffing boxes in the valve chests F 1, F 2, it is attached to the valves *e* 1 and *e* 2, being itself actuated by the lengthened extremity of the lever H 2 pressing against the collar formed on the rod; *n* 2, *n* 2, is a rod attached to the lever H 1, and ac-

* Patented July 16, 1841.

he levers *n* 3, *n* 3, whose centres he upright K, and whose extre- ove the valves *d* 1, *c* 2 by their oving through stuffing boxes in n chests F 1, F 2, as shown in ing. The moving apparatus for ; the valves, which I have so far l, only effects such opening and of the valves as is common to, ired by, all condensing engines; e of the cams No. 2 and No. 3, y for that purpose is shown by

ams 2 and 3 are made fast on 4, which is put over, and can the shaft *h*, and on which is the which carries the front end of the d shaft. The plate 5 is also se- the same tube, but is outside of the beyond it projects the shaft *h*, on fastened the cross bar 6, carry- ch end the click 71 and 72; in of the plate 5 is formed a long fall, as shown in the figure; ts face is fastened the stud and . When, as in the figure, the intended to turn with their up- s moving from right to left, the brought against that part of the which appears lowermost in the of the parts as drawn, and the is forced by its spring into the otch, so as to abut against one ; when it is desired that the en- ll turn the other way, the cams brought into the right relative by releasing the click 71, and round the plate 5, and tube 4, cams it carries, until the stud against the other part of the r 6, and the click 72 abuts against r end of the fall in the plate 5. are levers carrying trucks which the cam No. 1 respectively at site ends of its vertical diameter, which through other parts the alves G 1 and G 2 are at proper nfined and set at liberty. They ected with each other by a spring, 1, *p* 2, are connecting rods, are levers, whose centres are sup- y the upright *k*, and which are d by the rods *p* 1, *p* 2, with the 1, *o* 2, respectively, as shown in ing; *r* 1, *r* 2, are levers jointed by to *q* 1 and *q* 2, and each carrying er end a strong pin or stud, which he slot *in the stem s 1 or s 2 of ctive escape valve G 1 or G 2*; *t* 1, *t* 2, and *u* 1, *u* 2, are the bearings in which the stems *s* 1, *s* 2 of the escape valves slide.

It will be readily seen that when, as in the position represented in the drawing, the smaller part of the cam No. 1 comes to the truck or lever *o* 1 (which should be when the piston is near the bottom of the cylinder), that lever will be depressed, and by means of the rod *p* 1 will bring down the joint by which the levers *q* 1 and *r* 1 are attached to each other, and thus withdraw the stud on the lever *r* 1 from its pressure against the end of the slot in the stem *s*1 of the valve G 1; the valve being thus released gives way to the pressure of the steam in the cylinder, and permits the escape of part of it as above described. During this time the larger part of the cam No. 1 holds down the lever *o* 2, by which the rod *p* 2 has been made to depress the joint of the levers *q* 2 and *r* 2, so as to bring them nearly into a continued straight line, and by this means the stud in the lever *r* 2 is strongly pressed against the end of the slot in the valve stem *s* 2, and the valve G 2 is firmly held in its place against the pressure of the steam in the cylinder. A further rotation of the cam holds both valves close, and at the end of a semi-revolution the upper valve is held close and the lower one set at liberty, which the action of the engine as before explained requires. The spring *o* 3 raises the lever *o* 2 when permitted to do so by the hollow in the cam No. 1.

I will now recapitulate briefly the course of the valve movements, and the way in which they are effected. Beginning with the piston near the bottom of the cylinder, as shown in the drawing, the escape valve G 1, is first released by the truck on the lever O 1 falling into the hollow of the cam No. 1, and the excess of steam escapes into the atmosphere at once, or along such pipe as may be used to conduct it; an instant after, and nearly at the moment the piston reaches the very extremity of the stroke, the eduction valve *e* 1, and the induction valve *d* 2, are raised by the rise on the cam No. 2 operating on the lever H 2; about the same time the escape valve G 1 has closed by the pressure of the atmosphere and the spring *g* 1, and is soon held fast again by the cam No. 1. This state of things continues during almost the whole time of the up-stroke. When the piston has

nearly reached the top of the stroke, the escape valve G 2 is released by the hollow in the cam No. 1 then coming to the truck or lever O 2: when the piston comes to the end of the up-stroke, the rise on the cam No. 3 raises the induction valves *d* 1 and the eduction valve *e* 2, the valves *c* 1 and *d* 2 having been just closed by the fall in the cam No. 2, and the escape valve G 2 having also closed, and being held fast by the cam No. 1. No further change takes place until the piston arrives near to the bottom of the cylinder, when the series of changes again commences.

Remarks by Mr. John Chapman, C. E.

[Abridged from Report to the Proprietor of the Patent.]

The principal feature of Mr. Henson's plan I understand to be this: the permitting the escape of as much steam, or nearly so, as will escape into the atmosphere, from the cylinder, near the end of the stroke, and condensing the remainder of the steam in the ordinary manner.

It is obviously important to ascertain in what time any given quantity of steam, of a certain density at the beginning, will escape into the atmosphere through a given aperture; for if it might possibly turn out, that this time was so great, as materially to interfere with the action of the engine, in this case any other advantages of the plan would be neutralized or overbalanced.

Mr. Henson has given no exact directions for the size of the aperture of escape. But assuming it to be in area about one-fourth larger than the usual size of steam pipes, taking the latter at one-fifth of the diameter of the cylinder, (and I see no reason why it may not be made yet larger) I find by calculation, that the necessary escape need not occupy more than one-tenth of the time of the stroke, which is time of the least value, since the crank is then very near the centres. If we suppose the aperture of escape to be duly proportioned to the pressure of the steam used, we shall certainly be doing no favour to the invention, if we calculate that one-tenth of the time of the stroke, or, what is the same thing, that the time occupied by the passage of the crank over 18 degrees, is the time employed in the discharge. Taking into account that the crank is then in a position in which the pressure on it really does very little in the rotary direction, and that the pressure of the steam is not withdrawn all at once, it will be seen that the power lost is very trifling; it is much under a fiftieth part of the power of the engine, and in many cases will not amount to half that quantity.

To consider next the comparative advantage. It should first be remarked, that the essence of the plan is, the getting rid of a quantity of steam by suffering it to escape into the atmosphere, instead of condensing it. Now it is obvious, that as the power by which it escapes is its excess of pressure above that of the atmosphere, there can be but little escape, and consequently little advantage, where low pressure steam is used: and as condensation is always employed in low pressure engines as well as in the improved engine, no advantage worth mentioning would follow the adoption of Mr. Henson's plan in steam engines of that class.

The case, however, is very different in respect of high-pressure engines working at full pressure. To their power it would add almost an entire atmosphere. It must, however, be remarked, that few existing engines are prepared, by the strength of their parts, to receive and transmit this additional power; but in many cases an equivalent advantage may be gained, by working the engine to its present power, with a smaller consumption of fuel. Suppose it were desired to work a non-condensing engine with an 18-inch cylinder, to the power of 40 horses, the steam must be 50 lbs. per square inch above atmospheric pressure. But by the adoption of this improved plan the same power would be produced by steam of 30 lbs. per inch on the safety valve. The expenditure of fuel in the former case would be 453 lbs. per hour, and in the latter 312 lbs.; being a saving of 141 lbs. per hour, which at 20*s.* per ton for 12 hours per day, and 300 working days in the year, amounts to 226*l.* per annum. From this, however, is to be deducted the expense of water for condensation, where it cannot be had without payment. Such an engine would require about 30,000 gallons of water per day.

igh-pressure engine, *worked ex- ely*, would be more economical in ıan this improved engine. The now described would work to 40 ɔower, if the steam were of about . per square inch total pressure (or . on the safety valve), and were at half the stroke. Its consump- coals would be about 270 lbs. per ıstead of 312 lbs., effecting a saving ttle more than one-eighth. The on the boiler would obviously be reat.

ı easy to see, however, that this f comparison may be carried to tent, and made to present almost ıired results, by altering the sup- ɔs as to the pressure and expan- ıder which the steam is worked.

ı however of consequence to ob- that on some occasions an econo- ıse of steam may be effected, by ing the expansive principle with ape of the extra steam; and by eans also the great inequality of 'e which forms an important ob- in many cases to the use of ex- : steam may be brought within le limits, while to some extent its ıges are obtained.

ıe improved engine with an 18 ylinder, be compared with a con- ; engine of the same power, the ıge will be found to be consider-)ne of forty horses' power, moving :t per minute, will have its cylin- 30½ inches diameter: its consump- water will be nearly 80,000 gal- r day, and of coal 400 lbs. per hour. ifference amounts to 50,000 gal- water per day, which in many si- s will be of very great importance, 3 lbs. of coal per hour, which, at te above-mentioned, is equivalent l. per annum.

ɔmpared with both the expansion with condenser and the low-pres- ıgine, there is yet another saving l to be effected by this invention. ıe engines the heat of the steam has done its work, is so combined ıe water employed in condensation, can be recovered and used again a very small extent; perhaps one- th of the fuel may be saved in this y supplying the boiler with heated ısation water. In the improved the method may be adopted, which ıdy in use with good effect in some high-pressure engines, of conveying away the discharged steam by a pipe which passes through the reservoir of water by which the boiler is fed. I suppose an eighth or a tenth of the fuel will be eco- nomised by this method.

These calculations will serve to show by example, the nature, and something of the extent of the advantages to be de- rived from this invention. It is clear that it is not applicable to low-pressure engines; and where the nature of the work to be done admits the unequal pres- sure produced by the extensive use of expansion, this engine will not be pre- ferred; but in the numerous cases where regularity of action is indispensable, and in very many others where the supply of water is scanty, this contrivance, I think, will be of great value. Nor does it need scantiness of water to furnish a reason for preferring it, since its consumption of coals is considerably less than that of a condensing engine of the same power.

I conceive that a judicious combination of this invention with others of recent origin, would render a material service to steam navigation. It seems to me probable, that in the large transatlantic steamers a saving of weight in fuel and machinery might be thus effected to the amount of 150 or 200 tons. The great importance of such a result, not only to the current cost and returns of steam vessels generally, but to the practicable length of steam voyages, needs no re- mark.

SMOKE BURNING.

Sir,—Permit me to direct your atten- tion to the accompanying paper by Mr. Robert Armstrong, on "Smoke Burn- ing," as it appeared in the *Mining Jour- nal* of the 8th instant, and to request its insertion, as it appears well entitled to the publicity which your columns will give it, on account of the great ingenuity it exhi- bits, and, as I propose, hereafter, making some observations on the new light it throws on an extremely difficult branch of the chemistry of combustion as applied to practice.

I am, yours, &c.
C. W. Williams.

Liverpool, January 11, 1842.

Sir,—Fully agreeing with a remark lately made by an able lecturer (Mr. Davies) at

the Athenæum, Manchester, that there is no locality in the world where a knowledge of chemical laws is of so much practical advantage as in this metropolis of manufactures, it was with peculiar pleasure that I lately heard of a most interesting application of those laws, in a newly-discovered process for burning smoke and economising fuel, by Mr. ——, by which those two important objects are effected in a manner far superior to any thing of the kind that has ever been seen before. The particular chemical laws thus applied are those relating to the diffusion of the gases, and other elastic fluids, said to be first discovered by Dr. Priestley; but the scientific principles of which were certainly first described by Dr. Dalton, in a paper read before the Manchester Philosophical Society, in October, 1801, and applied by him to the explanation of various atmospherical phenomena, as is well known.

The principal feature of Mr. ——'s plan is the compelling all or most of the carburetted hydrogen, and other combustible gases, which escape inflammation when first generated from the coal in the furnace, to return again and pass through the fire, where they are converted into flame under the boiler. The process is effected by placing a small rotary fan in connexion with that part of the flue through which the smoke is passing off to the chimney after having left the boiler. The fan being made to revolve with considerable velocity, exhausts the smoke from the smoke flue, and at the same time propels it through an additional return flue, leading to an enclosed ash-pit, from whence it is, by the joint exhausting and propelling action of the fan, forced to pass through the fire-grate, where complete combustion is effected, and the products of this second combustion again pass under and around the boiler as before, and hence up the chimney, in the state of vapour, carbonic acid gas, and azote, which are perfectly colourless.

Your chemical readers will be well aware, that this circulatory process, which, for want of a better word, I call double combustion of the fuel, cannot go on without a continual supply of atmospheric air, which is admitted at a small aperture, situated between the fan and the place where the latter communicates with the smoke flue; and it is in the particular adaptation of this aperture, with respect to the fan and to the chimney, that the peculiar philosophical principle which distinguishes this invention is brought to bear with so much effect.

It was demonstrated by Dr. Dalton, in the paper before referred to, that different gases act as vacua to each other, and it has recently been shown by Professor Graham, *that the different gases* have a tendency to diffuse into each other, with different (of rapidity, which bears a certain rela their specific gravity; and hence it that, by availing ourselves of this te in mixed gases, a sort of mechanical tion of the various gases may be e Now, it is precisely this separation effected by Mr. ——'s process—the sumed carburetted hydrogen and c oxide are returned under the fire-grate with a fresh supply of oxygen; while, same time, nearly the whole of the n and heavy carbonic acid gases are allo pass off below to the chimney.

From a consideration of this theo intelligent manufacturer will perceiv so far as the saving of fuel is derive the burning of the smoke, it is not t that purpose alone that the fan or bl required—the latter has a much mo portant duty to perform than that of forcing the smoke through the fire, a is, the blowing of the fire. The effe strong draught generally, is not to b smoke, as usually understood, but ra create such an intense heat, that complete combustion of the fuel is e and consequently, less smoke is prod

Leaving out of view, for the pres much disputed point, as to the a amount of heat that it is possible to s burning the whole of the smoke in a (although all who have seen Mr. —— in operation, at his own works, ar pelled to acknowledge that it entirel the whole of the smoke—therefor saving is effected, whatever its amou be); it may be stated, that, in regard turning the smoke to the ash-pit, w an essential point in this invention, not appear that the use of the fan is abs indispensable; for the lighter gases constitute the most valuable part smoke, have, according to Dr. Dalto of the "Diffusion of the Gases," be ferred to, a natural tendency to le carbonic acid gas, and rush into the as they would into a vacuum, at th time, from their buoyancy, carryi light carbonaceous matters with the the atmospheric air, which is essen supply oxygen to support the combu those gases, not having this diffusi dency to so great an extent, require supplied by artificial means, and f purpose a very small fan is necessary whole of the atmospheric air that i sufficient to supply oxygen to the fur a twenty-seven-horse boiler is admi the fan through an aperture of only 10 by 4, and certainly does not requir than a quarter of a horse power to pr because the smoke which passes thr

time, both from its levity and the endency to diffusion, before men- ither assists the propulsion of the otherwise. By running the fan at nt speed, of course any degree of an be obtained that may be thought , even to the burning of the anthra- tune coal, or any common coal of uality. Indeed, a considerable speed iry; for, as Sir Humphrey Davy proved (and on which the theory of lamp is founded), carburetted hy- r coal gas, is the least combustible the inflammable gases, and conse- equires a strong draught to effect lete combustion. And here the will no doubt occur to many, as to e probable effect of this necessarily raught, or "blast," against the ttom. This is an important ques- t it fortunately admits of being wered by any chemist who duly the *rationale* of the process, as ove; and the practical man, who nothing but facts, will find, upon i, that boilers have been working nths on this plan, with fires con- nder them, apparently capable of velding heat to iron, without sus- e slightest injury; and, moreover, id, that the underside of the grate- m which such intense combustion going on, is never found at a higher ire than the metal of the burner of ry gas light.

h-pit is, under the circumstances, i into a reservoir of mixed com- ;ases and common air, in such pro- as enables the latter to yield suf- ygen for combining with the former duction of carbonic acid and water r steam), and thereby eliciting the i quantity of heat from a given of fuel, besides sufficient oxygen to he less perfect combustion of the , when first thrown upon the fire- oreover, as these changes and com- are being continually and rapidly and although they are only the well enomena of ordinary combustion, are, in this case, carried on in an re (so to speak) surcharged with a roportion of nitrogen and steam, eing neither supporters nor com- , but being propelled by the fan in mixture with other elastic fluids ess these properties in an eminent ere can be no doubt that, in this f double combustion, those two in- ble substances effect the very im- urpose of diluting and modifying ting property of the "blast." In peculiar mixture *of elastic fluids* thus effected, produces what is, I believe, called by some mineralogists, and others conversant with the use of the blowpipe, the "deoxidising flame." At any rate, a similar result is characteristic of Mr. ——'s process, in contradistinction to the ordinary process of blowing the fire with crude air; which latter method, whenever resorted to, has always effected the rapid oxidation of the grate bars, and the destruction of the furnace; but, according to Mr. ——'s plan, where the smoke itself is actually made in part the medium for blowing the fire, the draught produces a totally different result; while the manner of effecting it is as complete and simple as it is unique in its application to steam-engine furnaces.

In conclusion, allow me to observe, that, in the above attempt to illustrate what I conceive to be one of the greatest discoveries of modern times, I am in no way anxious to be considered as giving the only true explanation of the scientific principles concerned in it. My intention has been principally to state facts for the consideration of the more experienced chemist; and if, in attempting to theorise upon the subject, I have overstepped the legitimate province of the practical experimentalist, I have to plead, that I have been urgently requested so to do by several manufacturers, whose interests are likely to be most extensively affected by the invention; and I may add, that the subject is not the less interesting, as it affects the health and comfort of the population of all large towns.

R. ARMSTRONG, C.E., Manchester.

MR. MALLET'S PROCESSES FOR THE PROTECTION OF IRON FROM OXIDATION AND CORROSION, AND FOR THE PREVENTION OF THE FOULING OF SHIPS.

The discovery of an effectual means of protecting iron, copper, and other metallic surfaces, from the injurious effects of exposure to atmospheric and aqueous influences, had long been an object of earnest, but nearly unavailing pursuit, as well among men of science as among mere practicians, when the successful application of iron to the building of ships gave suddenly a new impetus and great increase of importance to the inquiry. Sir Humphrey Davy had found out how to save copper sheathing from corrosion, by means of zinc protectors; but subsequent experience showed that, in proportion as the copper was thus

electro-chemically preserved, it was rendered more liable to be *fouled* by the adhesion of animal and vegetable substances—an evil scarcely inferior in magnitude to that of the destruction of the copper itself; and farther than the point so reached by Davy, science had not advanced, when the first iron ship was launched into the deep. Much was at one time said of certain patented processes of zincing, by which it was alleged iron could be so thoroughly coated, as not to leave a speck unexposed for air or water to act upon—and much was hoped from them; but one after another they all proved decided failures. In the best zinced sheets of iron produced by these processes, there were always found a number of spots which had been left bare, by the collection of rust on which, the protective power of the zinc, in respect to the remainder of the iron, was almost entirely neutralized. Of "anti-corrosive" and "anti-barnacle" paints and varnishes there had been also an abundance, both before and since the days of Davy, but not one which could be said to have survived the test of practice, or which was not, more or less, of an empirical character.

So matters stood—that is to say, about the time of iron first coming into extensive use for the construction of ships—when the British Association were induced to take up the question, as one of the most practically important of the day, and to devote a portion of their funds to the institution of a series of experiments in relation to it, under the direction of Mr. Robert Mallet, of Dublin, a gentleman eminently fitted, by practical habits and experience, as well as by scientific knowledge, to do justice to the task intrusted to him. The details and results of these experiments are related in two reports made by Mr. Mallet to the Association, and published in their Transactions: and though they go little farther than to show the defects of existing processes, (that of zincing more particularly,) they must be allowed to have accomplished a most valuable service, in having cleared the subject from the vast mass of false science and erroneous practice by which it had become encumbered.

Mr. Mallet, following out the course of investigation thus auspiciously commenced, has since happily mastered all the difficulties of the case, and devised a series of remedial processes with so much of science, and therefore of sufficient reason in them, as to leave no doubt on our minds of their perfect efficiency. To indicate briefly Mr. Mallet's discoveries, they may be said to consist, *first*, in a method of zincing iron so perfectly, that not a spot of the iron is, or can be, left unprotected; *second*, in a method of protecting iron and other metals by means of palladium, (at a moderate cost.) which renders them as incorrodible by air and moisture as palladium itself (*palladiumizing*, it may be called, with as much propriety as we say, *zincing*, or *gilding*, or *soldering*;) and, *third*, in a new paint, to which, from its life-destroying properties, Mr. Mallet has given the name of *zoofagous* paint, by the application of which to vessels, whether of wood or iron, or with whatever material they may be sheathed, *fouling* is rendered impossible. The following details of these processes, which we have great pleasure in being the first to lay before the public, we extract from Mr. Mallet's specification, which has been just enrolled.*

1. *The Zincing Process.*

Supposing the articles about to be zinced, are plates and ribs of iron, intended to be employed in the construction of an iron vessel, they are first carefully cleaned from all adhering oxide. With this view they are immersed edgewise in a suitable vessel of wood, pottery, stone or lead, containing dilute sulphuric acid of the specific gravity of about 1·300 at 60° of temperature, or dilute hydrochloric acid of the specific gravity of about 1·060 at 60° of temperature, formed by diluting these acids respectively as they are usually found in commerce with rather more than an equal bulk of water. As it is of importance that the scales of oxide should be detached as rapidly as possible, the diluted acid should be warmed; and this may be conveniently effected by means of a steam jacket round the vessel, or by blowing steam into the acid; the acid vessel, or "Cleansing Bath," as it may be termed, should be so constructed for operations on a great scale, that the lower portion of the acid, and the scales which are precipitated, can be occasionally withdrawn to prevent waste of acid, or the cleansing process from being inconveniently protracted. The iron must be wholly, not partially immersed, and the bubbles of gas formed on its surface must be free to ascend in the fluid and escape. As

* Enrolment Office, January 7, 1843.

soon as the scales of oxide have become detached or loosened, the articles are to be removed from the "cleansing bath," thrown into or washed with cold water, and struck or hammered to shake off and detach the scales. In the case of flat boiler plates they may be advantageously passed backwards and forwards, through the machine known to boiler makers as "a mangle." The surfaces of the iron are then to be thoroughly scoured, by hand or by any suitable machinery, with sand or emery, or with pieces of grit stone, while exposed to a small running stream of water, until they appear quite clean and of a bright metallic lustre. The articles are now, before being allowed to dry, to be plunged into a "preparing bath," consisting of the following mixture: A saturated cold solution of chloride of zinc is made by dissolving zinc or its oxide in hydrochloric acid; to this is added an equal bulk of a saturated cold solution of sal ammoniac; and to the mixed solutions as much more sal ammoniac in the solid state is added, as they will dissolve. Or, these solutions may be made and mixed hot, and the solid sal ammoniac then added, but the addition of some cold water will then be requisite to dissolve the whole of the salts so formed. The bath may also be formed of sulphate of zinc and sulphate of ammonia, or acetate of zinc and acetate of ammonia, or of any other soluble salt of zinc and ammonia or salt of manganese and ammonia. The nitrates of zinc and ammonia are the least advantageous, and it is stated that none answer the purpose so well as the chloride of zinc and sal ammoniac first before directed to be used. No free acid should be present in these solutions. As soon as the surfaces of the immersed articles appear covered all over with minute bubbles of gas they are then in a fit state for combining with the metallic alloy with which they are next directed to be coated; but they may be allowed to remain in the preparing bath for any convenient length of time without injury or prejudice to the subsequent processes. The metallic alloy last referred to is prepared in the following manner: A quantity of zinc is melted in a suitable vessel (one formed of pottery or stone is found to answer best), and when it is in a state of fusion, mercury or quicksilver is added, in the proportion of 202 parts of mercury to 1292 parts of zinc (both by weight) being in the proportion of one atom of mercury to forty atoms of zinc, both upon the hydrogen scale. The two metals are well stirred or mixed together with a rod of dry wood or of iron coated with clay; and when this has been done there is added one or the other of the metals known to chemists and others as potassium and sodium (the metallic bases, of which the well known alkalies *potash and soda, are oxides*) in the proportion of a pound or thereabouts of potassium or sodium to every ton weight of the alloy of zinc and mercury, or in some cases less will suffice; either potassium or sodium will answer the purpose, but Mr. Mallet prefers the latter, as more easily obtained and more manageable. Whether it is potassium or sodium which is used, it is removed from the naphtha, or other fluid in which it is customary to keep these metals, in order to preserve them from oxidation, in small portions of not more than half an ounce at a time, and by means of a small inverted cup of wood, formed on the end of a stick, thrust rapidly below the surface of the alloy of zinc and mercury, so as to avoid any waste or combustion of the alkaline metal. A triple alloy is thus formed of zinc, mercury, and sodium or potassium, which, having been again stirred and mixed with the rod of dry wood, or of iron coated with clay, is now ready for covering or coating the prepared iron. The combination of these metals is facilitated, and their oxidation on the surface retarded, by pouring upon their fluid surface some of the liquor of the preparing bath, or strewing upon it some of the salts dissolved in that liquor in a dry state.

The plates or ribs of iron are now to be taken up out of the preparing bath, permitted to drain for a few seconds, and while still wet with the liquor of the preparing bath, immersed in the triple alloy in a state of fusion. As soon as they have acquired the temperature of the bath of alloy, they are to be withdrawn from the metallic bath edgewise or endwise, when they will be found covered with a perfectly uniform and coherent coat or surface of the alloy. The affinity of this alloy for iron is, however, so intense, and the peculiar circumstances of surface as induced upon the iron presented to it by the preparing bath are such, that care is requisite lest by too long an immersion the plates are not partially or wholly dissolved. Indeed where the articles to be covered are small, or their parts minute, such as wire or nails or small chain, it is necessary before immersing them to permit the triple alloy to dissolve or combine with some wrought iron, in order that its affinity for iron may be partially satisfied and thus diminished. At the proper fusing temperature of this alloy, which is about 680° Fahr. it will dissolve a plate of wrought iron of an eighth of an inch thick in a few seconds. No sputtering is produced by the immersion of the iron wet from the preparing bath into the alloy; but care is to be taken that there are no hollow places or cavities in the articles immersed which the alloy cannot wholly fill; lest in such case steam may be generated below the surface of the metal, and a dangerous explosion be thereby occasioned. It is

stated to be desirable that the melting vessels should be as deep and expose as small a surface as the nature of the articles to be immersed will allow. At the moment of immersion of the articles, the surface of the alloy is to be cleansed of all dross or oxide by a wooden skimmer. As soon as the iron plates or ribs are withdrawn from the alloy or "Metallic Bath," they are to be plunged into cold water and well washed therein. The surface of the iron is now in a condition permanently to resist corrosion and oxidation in air, or in salt or fresh water.

All the foregoing operations are best performed upon the plates or ribs after they have been bent and fitted to their places, and the plates have been riveted together into large pieces of eight to ten feet square or more. When again put "into frame," or placed in their respective positions in the ship's hull, they are directed to be united by rivets countersunk from the outside, and consequently headed inside the vessel. The countersunk heads of these rivets are to be also coated with the triple alloy in the manner before described, and tongs of iron are to be provided, having a very large mass of metal in their jaws, between which a hollow seat, of the shape and size of the countersunk rivet head, is to be formed to receive it. An alloyed rivet being seized by a pair of such tongs may have its point heated to a riveting or welding heat without injuring the coat of alloy upon its countersunk head; for the heat is carried off from the latter so fast by the contact of the large mass of iron in the jaws of the tongs, which are to be cooled occasionally, as to prevent the head of the rivet becoming hot during the heating of the point in a common smith's fire.

The hull of the iron vessel, being thus completed, and wholly covered with the alloy, is then to receive a coat of varnish all over, of either of the compositions about to be described. If possible, this varnish should be laid on with a spatula or thin flexible blade of horn, or some such material, as a brush produces minute air bubbles, which leaves spaces uncovered on the drying of the varnish. The varnish will dry, or get hard and coherent, at ordinary temperatures; but when practicable, it is desirable to expose it for some hours to a temperature of about 300° Fahrenheit, which gives it greater adhesion and durability. The iron surfaces may be warmed in successive portions by heat radiated from "chauffers" or open fires of coke, or by any other convenient means. The varnish may be either of a composition, which Mr. Mallet terms No. 1, or of another, which he terms No. 2. The composition, No. 1, is formed as follows:—Take 50 lbs. of foreign asphaltum, melt and boil it in an iron vessel, for three or four hours; add gradually 16 lbs. of red lead and litharge ground together to a fine powder in equal proportions, with 10 imperial gallons of drying linseed oil, and bring all nearly to a boiling temperature. Melt in a separate vessel 8 lbs. of gum anime (which need not be of the clearest or best quality); add to it two imperial gallons of drying linseed oil, boiling, and 12 lbs. of caoutchouc softened, or partially dissolved by coal tar naphtha (as practised by the makers of water-proof cloths). Mix the whole together in the former vessel, and boil gently until, on taking some of the varnish between two spatulas, it is found tough and ropy. When this "body" is quite cold it may be thinned down, with from 30 to 35 gallons imperial of turpentine, or of coal naphtha, which will make it ready for use. Mr. Mallet states this to be the best varnish he is acquainted with for this purpose. It is not acted on when dry and hard, by any moderately diluted acid or caustic alkali; it does not by long immersion combine with water, and so form a white, and partially soluble hydrate, as all merely resinous varnishes and all oil paints do; it is, moreover, so elastic, that a plate covered with it may be bent for several times without its peeling off. And, lastly, it adheres so fast, that nothing but a sharp edged instrument will scratch it off the surface of iron. The composition No. 2 is of a cheaper sort, but not quite so good. Common coal or gas tar is to be boiled in an iron cauldron, at so high a temperature, that the smoke from it is of a yellow dun colour; or the tar is to be caused to flow through red-hot iron tubes. The boiling passage through the tubes is to be continued until the residue is a solid asphaltum, breaking with a pitchy fracture. It is essential that the boiling should be carried on at this high temperature, as the permanence of the varnish in water depends upon the tar having been submitted to the temperature at which naphthaline is formed, by the decomposition or breaking up of the original constitution of the tar. Take 56 lbs. of this coal tar asphaltum; melt it in an iron vessel: add 10 imperial gallons of drying linseed oil, ground with 25 lbs. of red lead and litharge, in equal proportions; add to the whole, when well mixed, and after boiling together for two or three hours, 15 lbs. of caoutchouc, softened or partially dissolved by coal naphtha, as before described; and when cold, mix with 20 to 30 gallons of turpentine, or coal naphtha, which will make the varnish ready for use.

2. *The Palladiumizing Process.*

The articles to be protected are to be first cleansed in the same way as in the case of zincing, namely, by means of the double

salts of zinc and ammonia, or of manganese and ammonia; and then to be thinly coated over with palladium, applied in the state of an amalgam with mercury.

[The directions given as to this process are meagre, in comparison to those supplied for the other processes; but we are informed that the protection afforded by the palladium is as absolute as that by the zincing, and by no means so costly as to exclude it from economical use.]

3. *The Zoofagous Paint.*

After the iron vessel has been zinced and varnished, in the manner before described, it is done all over (above the varnish, of course,) with a strong-bodied thick paint. This is composed of drying linseed-oil, red lead, and sulphate of barytes, (or white lead may be used, but not so advantageously,) and a little turpentine. To every 100 lbs. of these ingredients, when mixed, is to be added 20 lbs., or thereabouts, of oxychloride of copper, and 3 lbs. of a mixture composed of hard yellow soap melted with an equal weight of common rosin, and a little water. The colour originally sold in commerce under the name of "Brunswick green," was an oxychloride of copper; but the present Brunswick green of commerce is a different thing, and will not answer. The oxychloride of copper may be obtained at a cheap rate, by various known methods, which it is unnecessary to detail. When the whole of the hull of the vessel has been done over with the paint, it must be permitted to dry and harden for three or four days, before the ship is floated out of dock. The entire series of operations are now completed; and the hull of an iron ship so treated will, Mr. Mallet assures us, "resist all corrosion from the action of air, and fresh or sea-water, and not be liable to 'fouling,' by the adhesion of marine animals and plants."

Mr. Mallet adds, that the power of the zoofagous paint to prevent 'fouling' arises from the fact, that the insoluble, or difficultly soluble salts of copper, and of certain other metals, are so noxious to the life of marine or aquatic animals and plants, which generally attach themselves to ships' bottoms, that they will not adhere or grow upon a surface so treated. The paint, therefore, is only a vehicle for poisonous matter, for which purpose it is requisite that it should have sufficient adhesion to resist the ship's motion, but still should have a slight degree of solubility in water, so that the poisonous matter may be taken up by the absorbent or capillary vessels of any adhering animal or plant. This latter property is given it by the addition of the resinous soap, the proportion of which should be varied to suit the climate to which a ship is going, more being used in frigid, and less in tropical climates. Mr. Mallet prefers using the oxychloride of copper, and has found it by much the most efficacious; but any insoluble or difficultly soluble salt, of copper, mercury, arsenic, or antimony, or any combination of these, whether soluble or insoluble, may be substituted for it.

General Observations.

Although Mr. Mallet deems it *advisable* that where new ships are intended to be protected by zincing, the iron should go through the whole of the processes before directed, namely, the cleansing, the coating with the triple alloy, the varnishing, and the final coating with the zoofagous paint, he remarks that they are not all equally essential, and points out how the same effects may be produced, though attended with less favourable circumstances, by the adoption of a part only of these processes:

"For, supposing the plates and ribs of iron were merely coated with the triple alloy of zinc, mercury, and potassium or sodium, without the addition of the protective varnish and zoofagous paint, it is certain that, on the exposure of this alloy to the action of air and water, the positive metal at the surface would be first acted on, and the surface become shortly covered with a very thin coat of amalgamated zinc, which is known not to be acted upon by fluid menstrua, (except under peculiar conditions, which do not exist in the case here supposed,) and does not, as I have found by experiment, gather to itself, when exposed to sea or fresh water, any of that calcareous coating which is productive of the fouling of vessels. The advantage gained by varnishing over this triple alloy coating is of a twofold nature. In the first place, it serves as a mechanical protection to the coating, and thereby to increase its durability; and, secondly, it shields the alloy from contact with the zoofagous paint, some of the ingredients of which would exert an injurious chemical action on the alloy. The office, therefore, of the triple alloy is simply to prevent corrosion and oxidation, (including, where used by itself, that of preventing the formation of calcareous adhesions;) that of the varnish, to protect the triple alloy; and that of the zoofagous paint, to prevent fouling, by the destruction of any marine animals or aquatic plants which may seek to attach themselves to the protected surfaces."

When the addition of the zoofagous paint is not required, to prevent fouling, as in the case of articles exposed to the action

of the atmosphere only, Mr. Mallet states that any desirable colour may be given to the protecting varnish, by a mixture of colouring materials, but that care must be taken that these colouring materials consist of per-oxides not liable to be acted on by air or moisture. The best method to adopt, however, with such articles, is said to be, to pay the varnish all over with a coat of oil-paint.

Finally, although the triple alloy is directed in the first instance, to be employed at the fusing temperature, Mr. Mallet states that, by the addition of a larger portion of mercury, articles of cast or wrought iron or steel may be coated with that alloy at a lower temperature, and even in a cold state, by means of simple contact and friction.

BADCOCK'S AUTOMATON LUBRICATOR ANTICIPATED.

Dear Sir,—On perusing the *Mechanics' Magazine* for the past month, I read, at page 446, a description of an "Automaton Lubricator," by Mr. Badcock.

This Lubricator so closely resembles an instrument which was invented by me, for the purpose of readily supplying equal measures of mercury, for dividing the capacity of glass tubes into any required number of equal parts, that it only needs to be supplied, (as mine is,) with an adjusting screw to regulate the capacity of the cavity in the plug, to make it complete for its intention. You did me the honour to notice the instrument to which I have referred in the *Mechanics' Magazine*, dated May 1, 1841.

Believe me very faithfully yours,

CHARLES THORNTON COATHUPE.

Wraxhall, January 5, 1842.

HOOD ON HEAT, AND THE INSTITUTION OF CIVIL ENGINEERS.

Sir,—Observing in your last number a paper headed "Hood on Heat," commencing with the observation, that "The Members* of the Institution of Civil Engineers have given an extensive publicity, as well as a *sort* of *implied sanction* to the contents of a paper lately read before that body," I beg permission to remind you, that every publication issued from that institution is accompanied by an announcement expressly disclaiming the *implied sanction* of which you speak. I quote the following from the last volume of the Transactions. "The Institution is not responsible for the opinions, statements of facts, or trains of reasoning contained in its publications; such responsibility rests entirely with the *authors* of the respective communications. Nor is publication in the Transactions of the Institution of the account of an executed work or invention, to be taken as an expression of opinion on the merits of such work or invention."

I am, Sir,

Your obedient servant,

C. E.

January 10, 1842.

* Error of the press, for "Minutes."—ED. M. M.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for that purpose.*

EDWARD HAMMOND BENTALL, OF HEYBRIDGE, ESSEX, IRON-FOUNDER, *for certain improvements in ploughs.* Petty Bag Office, December 10th, 1841.

These improvements consist, firstly, in the peculiar construction and mode of adapting an adjustable lever to the frame of the plough, for the purpose of changing the inclination of the share, which is attached to the end or nose of the lever, so that the point of the share may stand at any required angle below or above the level of the sole slade or ground of the plough.

Secondly, In the particular form of the shares, and modes of attaching them to such adjustable levers.

Thirdly, In the mode of affixing the breast or mould board to the plough, in order that it may rise and fall with the adjustable lever and share.

Fourthly, In the means of contracting or expanding the breasts of a double breast plough, when such double breast is cast or formed in one piece.

The first improvement is carried out in the following manner: a lever is placed at the front of the frame, having at its lower end a groove, in which a step on the sole of the plough works, allowing a small movement backward and forward; beyond this fulcrum the lever is fixed to the plough-frame by a loose bolt. At the top of the lever, on its front face, is a screw, which passes through the centre of a projecting piece or ear of the plough-frame, being secured in any required position by a nut on each side of the ear or projection. By shifting these nuts backward or forward, therefore, the position of the lever is varied, and any required degree of inclination obtained at pleasure.

Another arrangement is shown and described, differing from the former only in,

that instead of the groove in the lever working upon a step, the lever works upon a central bolt passed through the frame of the plough. The mode of attaching the share is also varied. The patentee observes, that "Having explained the manner by which I vary the position of the point of the share by an adjustable lever and screw, I would add, that should it be thought desirable to make this adjustment while the plough is in progress, it may be done by means of a horizontal screw shaft, extending from the front to the back of the plough, the forward end being passed through a swivel eye or socket at the top of the lever, the hinder end of the shaft being supported in a bearing fixed into the back part of the plough, and the shaft turned when required by a winch or other apparatus, within convenient reach of the ploughman."

[This arrangement formed the basis of certain improvements in ploughs, patented by Mr. Theophilus Smith, of Attleborough, in February 1841,* whose patent would, therefore, be infringed by such an extension of Mr. Bentall's contrivance.—Ed. M. M.]

As it is necessary that the breast should rise and fall with the varied position of the share, the front of the breast is attached to the lower end of the moveable lever by a pin or bolt; the back or hinder part being attached to the frame by means of a contrivance commonly called a way-pin or way-bar.

For the purpose of contracting or expanding the breast of a double-breasted plough, when such is cast or otherwise formed in one piece, two screw bolts are affixed, one on the inner side of each breast; these screws pass through the two ears or projections of a way-bar, which is bolted to the frame, and are each secured by nuts on each side of the ear. By moving these nuts backward or forward the two breasts are contracted or expanded and set at any required distance apart; the elasticity of the metal allowing (it is said) of sufficient play for this purpose.

The patentee recommends, as advantageous, the case-hardening of the inner front of each breast to afford increased durability.

Alexander Horatio Simpson, of New Palace-yard, Westminster, Gentleman, Peter Hunter Irving, and Thomas Eugene Irving, both of Charles-street, Hatton-garden, Philosophical Instrument Makers, *for an improved mode of producing light, and of manufacturing apparatus for the diffusion of light.* Enrolment Office, December 17, 1841.

The first of these improvements consists in the production of light, by means of ignited pyroligneous spirit, across which a jet of oxygen gas is driven, causing the flame to impinge upon a cylinder of lime, kept at a proper height by suitable apparatus, and either turned occasionally by hand, or kept in continual rotation by means of clock-work.

The second improvement consists in manufacturing reflectors for lamps of all kinds, in copper, and afterwards silvering them by the electrotype process. These reflectors may be afterwards polished, or employed in the unburnished state for the diffusion of a subdued light.

John George Truscott Campbell, of Lambeth-hill, Upper Thames-street, Grocer, *for improvements in propelling vessels.* Enrolment Office, December 18, 1841.

These improvements in propelling vessels consist in the application of curious levers or shanks with guides, or levers without guides, by means of springs and propellers to be used under water, and whose combined action are a series of inclined planes moving between two parallels, thereby producing a very powerful reciprocating undulatory motion "with the least resistance possible," it being only the thickness of the propeller. The only place where they can be worked with ease and useful effect is in a hole at the after part of a vessel, immediately before the stern post.

To distinguish this propeller from all others, and on account of its peculiar action, "being the nearest approach to nature, and consequently obtaining the greatest velocity," the patentee calls it the "Whale Tail, or Fluke Propeller," and states that the experimental boat, "Ærolite," which is 69 feet long, and 9 ft. 4 in. beam, is fitted with this propeller. Within a frame at the hinder part of the vessel, but in front of the stern-post, there is a horizontal shaft upon which two triangular shaped frames or levers are mounted; that in the starboard side is used for forward propelling, the larboard for backing astern. The upper and inner angle of the lever is joined to a connecting rod, attached to a main rod proceeding from the engine, and working through a stuffing box in the bulk head; at the opposite angle a horizontal propeller is joined to a knuckle, and as the engine draws the connecting rod to and fro, the propeller beats up and down, within the limits prescribed for its motion by the right angled form of the space in the lever in which it moves; when one propeller is in action, the other is held quiescent in a horizontal position, thus offering only the resistance due to its thickness.

George Thomas Day, of Upper Bel-

* For a description of Mr. Smith's invention, see vol. xxxv. p. 178.

GRAVE-PLACE, PIMLICO, GENT., *for an improved apparatus for creating draft, applicable to chimneys and other purposes.* Enrolment Office, Dec. 23, 1841.

This apparatus consists of a vertical cylinder, in the centre of which a spindle is mounted, carrying the thread of an archimedean screw. A rapid motion being given to this spindle by a suitable arrangement of wheel-work, a strong upward current of air is produced within the cylinder, which may be applied for increasing the draft of chimneys, or for ventilating apartments, &c.

WILLIAM LOSH, OF LITTLE BENTON, NORTHUMBERLAND, ESQ., *for improvements in the manufacture of railway wheels.* Enrolment Office, Dec. 24, 1841.

These improvements, relate to the application of wood, felt, rope, or other such like flexible or yielding material between the inner tyre and the ring or felloe, or bearings produced by the prolongations of the bars of iron employed to make the wrought iron spokes, with or without the intervention of a ring of malleable iron between such bearings and such flexible or yielding material; by which means wrought iron railway wheels will be less liable to be prejudicially acted on by the vibrating to which such wheels are liable when in use, than if they were composed of iron alone.

The sort of wheel to which these improvements are said to be applicable, are those included in the patentee's former patent of August 1830.

[The introduction of wood or fibrous materials intermediately between the spokes and the tyre, is included in the previous patent of Mr. Edmund Tayler, of which we gave an abstract at page 413 of our last volume.—ED. M. M.]

MOSES POOLE, OF LINCOLN'S-INN, GENTLEMAN, *for improvements in producing and applying heat.* (A communication.)—Enrolment office, Dec. 24, 1841.

The invention which forms the subject matter of this patent, is the mode of producing and applying heat discovered by Mr. Faber, director of the Royal Mines at Wasseralfingen, in Wirtemberg, referred to in the communication of C. Detmold, Esq., C.E. to our esteemed correspondent, C. W. Williams, Esq., and published at page 5 of our present volume.

In the specification, these improvements are described as consisting: firstly, in a new mode of heating furnaces used in the different manufactures, by employing carbonic oxide gas as fuel, instead of coal, coke, peat or wood. In the manufacture of iron and other metallurgic operations where blast furnaces are used, this carbonic oxide gas is obtained in a pure and uninflamed state; from the blast furnace it is taken some distance below the mouth and conveyed by means of a suitable apparatus to any other furnace that requires to be heated. Secondly, In a new mode of heating furnaces by means of carbonic oxide gas, which may be obtained from a separate furnace expressly constructed for that purpose. Thirdly, in a mode of applying the blow-pipe to furnaces, whereby the withdrawal of the carbonic oxide gas in the working furnaces is facilitated, and the combustion in the furnaces or boilers, assisted by the mixture of heated air with the carbonic oxide gas, thus producing a most intense heat.

This invention is stated to be applicable to the furnaces used in the different processes for the manufacture of iron, and the treatment of other minerals generally, as well as to ovens or furnaces requiring a high temperature, such as glass or pottery furnaces, gas-works, breweries, for evaporating fluids, and to the purpose of generating steam. Its application to the manufacture of iron is minutely detailed, and illustrated with numerous drawings of the furnaces, apparatus, &c., employed.

WILLOUGHBY METHLEY AND THOMAS CHARLES METHLEY, of FRITH-STREET, SOHO, IRONMONGERS, *for improvements in machinery for raising, lowering, and moving bodies or weights.* (A communication.) Enrolment Office, Dec. 24, 1841.

These improvements are first shown as applied to the weighing of anchors, &c. by an apparatus proposed to be employed in lieu of an ordinary capstan. In the centre of a strong iron frame, there is a vertical shaft or spindle, having at its lower end a small toothed wheel or pinion, and fitted at its upper end with an ordinary capstan head; two grooved barrels are also placed vertically within the frame, one on either side of the central shaft or spindle: at the bottom of each barrel there is a large cog wheel into which the central wheel or pinion works. The lower grooves of the barrels, where the rope is first received are rounded, but they gradually sharpen as they approach the upper part of the barrel. On the under surface of one of the barrels a ratchet wheel is fixed, into which a series of palls take, in the usual manner, for holding on. On the right hand side of the frame there are two guide pulleys for guiding the slack of the rope, which on turning the capstan head will work without fleeting or surging. A second modification of this invention is shown as applied to a windlass, in which two barrels are placed horizontally one before the other: a portion of their circumference being furnished with a number of grooves, by means of which ropes or cables may (it is said) be worked without surging or fleeting, by means of windlass levers, or other suitable machinery.

SMOKE NUISANCE MEETING AT LEEDS.

A numerous and highly influential meeting took place at the Music Hall, at the instance of Edwin Eddison, Esq., of Leeds, on Wednesday last, for the purpose of examining and discussing the various inventions for preventing smoke. Sir W. Beckett, Bart., M.P., took the chair at 12 o'clock, and having, in a very suitable address, explained the objects of the meeting over which he had the honour of presiding, he trusted that the effect of the day's proceedings would be to lead, practically, to an abatement of the great nuisance of smoke which hung over their town, and was so injurious to the health of its inhabitants. The chairman then called on the several patentees, who were present, to explain their respective inventions.

Among those whose patents were explained were, Mr. Thomas Hall, Mr. Williams, Mr. Chanter, Mr. Iveson, Mr. Rodda, Mr. Drew.

Mr. Draper, for Mr. Thomas Hall, explained, chemically, the nature of combustion, and the necessarily large quantity of air which was required for the combustion of the 10,000 cubic feet of gas which was generated from every ton of coals, and explained how his plan would provide for such an adequate supply; contending that the charge against it, of not providing a sufficiency, was erroneous.

Mr. C. W. Williams said, he would not enter into the chemical details of the question, but satisfied himself by speaking to the prevention of smoke. He then combated, at some length, the idea that smoke could be consumed in a furnace. In explaining his mode of effecting the combustion of the gaseous part of coal, from which smoke was generated, he referred to the difference between the perfect combustion of the gas from the numerous minute apertures of an argand gas-burner, as compared with that from the same quantity of gas when the burner was unscrewed, and the gas allowed to escape from the tube above. He contended that this difference explained the whole question *of the prevention of smoke, and the principle on which nature proceeds in the combustion of the gas.* The bringing a full supply of air to the gas was not sufficient, as Mr. Hall had stated. So intimate an incorporation of the atoms of gas and air must be effected, that those which were respectively to combine, and to effect combustion, must be brought together and into contact, not in masses, but in atoms.

Mr. Rodda read from a paper a description of his furnace, by which air was admitted by side apertures.—(See *Mech. Mag.* No. 837.)

Mr. Chanter explained, at considerable length, his invention, and referred to a numerous list of testimonials. He stated that he had six patents, and the last he seemed to prefer to any of the former.

Mr. Bell, for Mr. Iveson, then read a statement of his invention of injecting steam into the furnace.

Several other patents were explained by the patentees or their agents, and with reference to models and drawings.

After all the patentees had gone through their explanations, a number of questions were put with reference to the length of time the inventions had been in use, the kind of coal used, the saving of fuel, &c., and an animated discussion ensued, of a highly interesting character.

The meeting lasted four hours, when a series of resolutions were adopted. The first was declaratory of the conviction of the meeting that the combustion of smoke could be completely effected, and so as to abate the great nuisance complained of. This resolution did not pass unanimously, as several gentlemen objected to the term "Combustion of smoke," on the ground that it was contrary to the opinion of the best chemical authorities, and that though the nuisance might be much abated, it was too much to speak so decidedly.

The second and most important resolution was for the appointment of a numerous and highly influential committee to receive communications and carry out the great object of the meeting.

Resolutions were also passed that a subscription be entered into in furtherance of the above object.

A highly complimentary and well worded

resolution of thanks was then voted to Mr. Eddison for the expense and trouble he had put himself to, and the exertions he had made in originating and organizing the meeting; the whole meeting, at the instance of the Chairman, standing up and expressing unanimously their concurrence with the resolution.

Written communications were then read from Mr. Samuel Hall, Mr. Charles Hood (with a copy of his paper on the combustion of coal), Mr. Josiah Parkes and several other parties.

The room contained many beautiful models, drawings, &c. of the inventions exhibited; and the whole affair went off with much spirit.

NOTES AND NOTICES.

Gonon's Improved Telegraph.—M. Gonon's telegraph is an improvement upon that now employed in France, and which, through all the mutations and revolutions of the French people, has been in constant use in that country for 48 years. M. Gonon, after reaching the height of Mr. Chappe's system, was led to believe that further means could be employed, and that he could correspond, word for word, without using more signals than words, which ample experiments, since had, have proved beyond the possibility of doubt. In view of these experiments, he is led to assert that, with 30 observations between Washington and New York, he could transmit from the latter to the former city the words—"The British fleet, three ships of the line and five frigates, appeared off the Hook at 32 minutes past 10," in five or six minutes.—*Baltimore American.*

Electrical Clocks.—In front of the Royal Polytechnic Institution there is a clock of large size, going by the action of voltaic electricity, the dial plate of which is illuminated at night for the convenience of the public. We believe this is the first street clock of the kind ever established, and its erection may be therefore looked upon as something both good and new in the world of science. For the purpose of keeping correct time simultaneously in a multitude of such clocks, the inventor proposes to fix a "regulator" in a central position, which is there to receive from a galvanic battery a continuous stream of electricity to be dispersed by itself, through the agency of an electro-magnet, to any number of time-pieces with which it might be placed in electrical communication, all of which would consequently keep time with one another, and with the controlling regulator. The Polytechnic clock has been going ever since Christmas-eve; and Mr. Bain, the inventor of the electrical clocks, avers that it will never require attention as long as the "regulator" is kept in motion, and the galvanic battery is supplied with its necessary elements.

Magnetic Disturbances.—Similar disturbances to those observed and recorded by the Astronomer Royal, at Greenwich on the 25th of September, and noticed in our last number, are stated by a correspondent of the "Times" (J. F. W. H.) to have been also observed, at the same time, at the Magnetical Observatories at Toronto, in Canada, at Longwood, in St. Helena, at the Cape of Good Hope, and at Trevandrum at the observatory established by his Highness the Rajah of Travancore. At all these stations, differing so widely in geographical position as to embrace nearly a hemisphere of the globe, the disturbance was of such extraordinary amount as to cause the immediate institution of extra observations. The disturbances continued during the 24th and 25th of September, and their phases, allowing for the difference of longitude, were simultaneous at all the stations. Returns have not yet been received from other stations, but are early expected from many, such as from Simlar in the Himalaya, from Van Diemen's-land, and from the Antarctic expedition under the command of Captain Ross, &c. The writer adds, "Independent of the great changes in the direction of the needle, the total intensity of the magnetic power of the earth appears to have undergone, at all these stations, and at the same instant of time, fluctuations which may well be regarded as astonishing. The whole magnetic system of our planet seems to have been during those two days, so to speak, in a state of convulsion. Philosophy will of course be busy in speculating on the origin of phenomena so surprising, but we must not forget a tribute of praise to the zeal and diligence of the officers charged with the direction of these observations, and who have followed them up so efficiently, nor to the liberality of the British nation in working out on so magnificent a scale the recommendations of scientific men, in this, by far the greatest combined scientific operation the world has yet seen undertaken." For "J. F. W. H." we fancy there can hardly be any mistake in reading "Sir J. F. W. Herschell."

Water Shoes.—A Lieutenant Hookenberg, of Denmark, has invented an apparatus, by means of which persons may traverse the water. It is described, (not very clearly,) as "resembling two very narrow boats, pointed at both ends, and united by a square piece of wood, about 30 inches long." The following account of a recent exhibition of it, before the Royal Family of Denmark, is given in the *United Service Journal.* "The arm of the sea which runs into the Thier Garter was the spot selected for the evolutions. The water-runners went through a variety of movements, among which were their loading and discharging their muskets while upon the water, running along on its surface at full speed," &c. The shoes, it is added, are so easy, that any person of moderate dexterity and quickness may be taught to manage them.

Bude Light.—On Monday evening last a Bude light was tried for the first time, as street illumination, at the extended crossing in Pall-mall at the end of Waterloo-place, Regent-street, and facing the Duke of York's Column. It very powerfully illumined the whole of the extensive space constituting the end of Regent-street and the opening at Pall-mall, and in front of the Athenæum Club-house, making the gas lamps along the pavements look as diminished as do the oil lamps at the end of Gower-street and in other parts of St. Pancras, where contrasted with gas-lamps.—*Times.*

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PALMER AND PERKINS'S PATENT PUMPS.

Fig. 3.

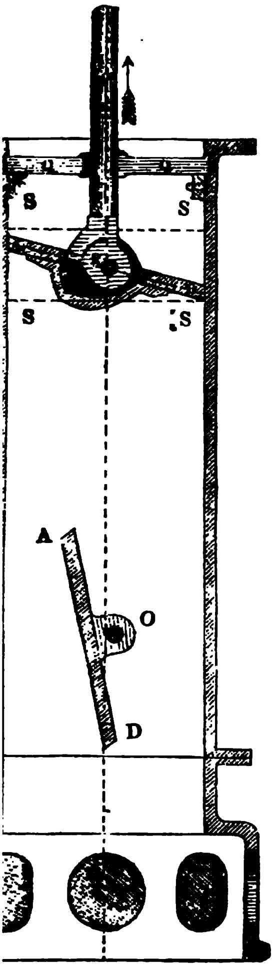


Fig. 1.

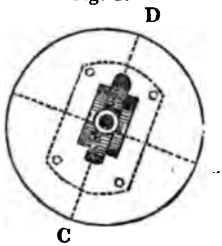


Fig. 2.

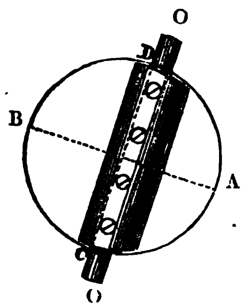
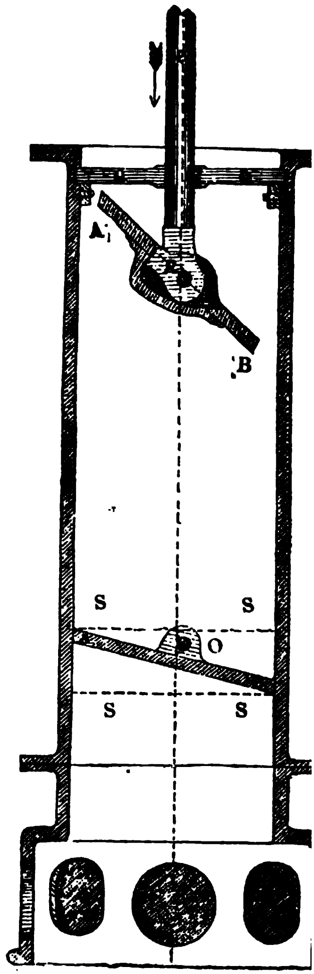


Fig. 4.



MESSRS. G. H. PALMER AND CHARLES PERKINS'S IMPROVED PISTONS AND VALVES FOR RETAINING OR DISCHARGING LIQUIDS, GASES AND STEAM.

The present improvements are brought before the public by the patentees, with an expectation that they have succeeded in making one of the most important articles of use, in the simplest form and of the most durable construction. Every one is aware in how many ways the pump is conducive to human operations, as well as the many casualties to which it is subjected by the manner in which, and the materials of which, it has hitherto been made. The action of a pump is derived from one or more valves opening upwards in the lower or fixed bucket (commonly called the clack), and from one or more valves also opening upwards in the upper or moveable bucket. These valves are either made of leather, or their motion (when not so made) is insured by hinges, or connexions usually made of the same material. The upper, or moveable bucket, moreover, in order to produce a vacuum beneath it in its ascent, is packed or fitted to the sides of the working barrel of the pump, either with leather or hemp—materials which are liable to be affected by differences of temperature in different climates, subject to the attacks of incrustation, to the operation of many wasting influences, and above all, to a rapid deterioration either from use or disuse. The moment these perishable adjuncts to the operation of a pump are out of order, the machine itself becomes useless.

Impressed with these facts, and having themselves suffered from their costly disappointments, the patentees, after many fruitless endeavours, hit upon the expedient of producing the desired action in a pump barrel by the substitution of two simple elliptical metallic discs for the complex and perishable packed and valved buckets previously in use; when (the natural consequence of every simple contrivance for a specific purpose,) they found all the evils of the old mode removed, and many advantages derived which were not before considered as obtainable.

To explain this invention more precisely: The pump barrel is fitted with two metallic discs, the lower one a fixture, the upper one connected to, and moving with the pump rod. These discs or pistons, are made elliptical, by being cut diagonally out of a solid cylinder of the same diameter as the pump barrel. They lie inclined in the barrel, and although in that position, they fit the circle of the barrel with the greatest accuracy, yet, by fixing the lower disc upon a spindle, and attaching the upper disc or piston to the rod *at points which divide the whole area of the discs into two unequal areas*, as soon as the machine is set in motion, and the upper piston is drawn upwards by the rod, it leaves a vacuum below it in the working barrel, when the fluid below from its tendency to rise into the vacuum, presses equally over the *whole surface* of the under side of the lower valve; in consequence, however, of the eccentric suspension of the lower valve, there is a greater amount of pressure over the larger area of the two into which the surface is divided, and this extra pressure causes the valve to vibrate on the spindle, and in so doing, forms a passage for the fluid. When this up stroke is completed, and the upper disc (which we will call the piston) is pressed by the rod to effect its descent, the lower disc (which we will call the clack) is then closed by the amount of extra pressure of the water on the upper side of its larger area, and the same principle which opens the clack, acting on the under side of the piston, it is disengaged from contact with the barrel, excepting at two infinitely small points (the imaginary termination of its minor axis,) presenting a very small surface in its descent through the fluid which had already passed the clacks. As soon as this down stroke is completed, and the up stroke commenced, the piston returns to its oblique position, lifting and discharging the fluid. A power of raising water is thus acquired by a new mode, but still resulting from the simple and unerring law of its own pressure. The improvement sought for was thus obtained; a pump was made entirely of metal—to a certain extent, therefore, of imperishable materials—and not liable to the derangement arising from those casual circumstances already alluded to.

As models fail to be convincing, two 10 inch pumps were made by Mr. Charles Robinson, of Pimlico, similar in every respect, with this exception, that one was

fitted with a packed bucket, and butterfly valves, the other with the patent elliptical discs; and Mr. Robinson has been kind enough to allow these two pumps to remain at his works for the practical satisfaction of such as may not be convinced by this description.

This size of pump, viz. 10 in. diameter, was chosen because the friction of a 10 in. pump was considered to absorb nearly the whole power of a man. So that the old and new modes would in such case stand fairly contrasted. The result turned out to be so, for the packed pump was very difficult to move, whilst that with the patent discs was worked with the greatest ease; so much so, as to make it evident to a common observer, that a man could do three times as much work with the patent as with the common pump.

This fact naturally induced the patentees to investigate the relative friction of the two pumps. The column of water was 5 feet in each; the diameter 10 inches, so that the weight of water was 170 lbs. nearly. The levers of the pumps were 6 to 1, and it required 49 lbs. at the extremity of the lever of the packed pump to make the upward stroke $49 \times 6 = 294$. But this was not all; for it required 28 lbs. over a pully to return the bucket, $28 \times 6 = 168$ lbs. Here therefore was exerted a force of 462 lbs., to raise a weight of water not exceeding 170 lbs., leaving 292 lbs. as the value of the friction; whereas, it only required 33 lbs. at the end of the lever $= 33 \times 6 = 198$ lbs. to raise the water with the patent pump; and as the piston returned of its own accord, deducting the weight of water, the friction was only 28 lbs.

The patentees expected to find some known data, or acknowledged rules, for determining the friction in pumps generally; but they were disappointed, while nothing could be more conflicting than the opinions of practical men on this subject, some fixing it at $\frac{1}{4}$th or $\frac{1}{3}$, when in fact there is no law to determine the friction *à priori*, depending, as it entirely does, upon the packing of the bucket, and the ease or difficulty with which the valves open and shut. Their experiments have led them to the conclusion, that in any and every packed and valved bucket which delivers faithfully the *quantity of water due to its diameter and length of stroke, the power necessary to overcome* the friction exceeds that which is requisite to raise the water.

A pump 10 in. diameter, with an 8 in. stroke, should deliver 2 gallons of water per stroke. Amongst the old dicta there is one of Desaguillier's, recorded in almost every treatise on the pump, to the effect, that with the best made pump one man, making a full day's work, ought to raise a hogshead of water, 10ft. high, per minute. Now, suppose this hogshead to contain 54 gallons of 10lbs. each = 540lbs. raised 10 ft. high, = 5400 lbs. of water only, exclusive of the friction of the bucket and valves, raised one foot high in one minute; but if the friction is to be 292 parts out of 462, this duty is impossible.

There is no longer any doubt that the friction in packed pumps is a serious quantity, increasing as the circumference and depth of the moveable bucket are increased, and absorbing power, both in the downward or return stroke, as well as in the upward discharging or effective stroke, while the metallic disc piston can be made sufficiently strong for any unlimited diameter of pump, by ribs, or other contrivances, without materially increasing the thickness at the periphery and consequently, the rubbing surfaces. Moreover, the friction will only exist in the upward or discharging stroke, and will never exceed what is due to the weight of the column of water tending to keep the piston against the sides of the barrel, instead of the undefined amount arising from the uncertain packing of the bucket in order to prevent the water slipping, both during the upward and downward stroke.

We have already shown what was the comparative friction of the two pumps at Mr. Robinson's, with a 5 ft. lift of water; and by way of illustrating the preceding observations, an experiment was made with another pump, intended to be 10 in. diameter, but bored rather larger, fitted with a cover and a branch to receive an ascending pipe; the pump-rod, of course, working through a gland and stuffing-box. Pipes of the same diameter were added to the branch, until the height from the level of the water in the well to the point of discharge was 15ft. 4in. The weight of such a column of water is 550lbs. The lever in this case was also 6 to 1, and 98lbs hung on the end accomplished the discharging stroke; hence

98 × 6 = 588 — 550 weight of water = 38lbs. for friction, or about $\frac{1}{18}$th part of the whole, being 10lbs. more than with the 5ft. column, without allowing for the friction of the rod working through the stuffing-box, and also for the trifling addition to the pump's diameter; thus showing that friction does increase with the height of the column. But in a pump on this principle, the increase is confined to a cause which cannot be removed.

The same opportunity was taken advantage of to approximate to what might be considered the *maximum* duty of a man whilst working with a pump of this construction. Two men made 41 strokes in *one* minute, lifting 2·24 gallons, or 22·4 lbs. of water 15ft. 4in. high at each stroke, which is equivalent to 14,107 lbs. raised one foot high in one minute by two men; and half that quantity, viz., 7053·5lbs raised the same height by one man.

The leading recommendations of these pumps consist in their *simplicity*—their *durability*, from being made of materials not of a perishable nature, and, unlike those of other pumps, improvable by use —and their great increase of *power*, in consequence of the abated friction in the *upward* stroke. So great is this last advantage, that on this account alone pumps of a larger diameter may be substituted for those now in use, and worked by *the same* power; nay, as the friction in the downward stroke is reduced to a minimum, a continued exhibition of the same power would, by the alternating effect of a crank, work *two* pumps of the same larger diameter. Take, for instance, ships in general, and a ship of 120 guns in particular, the pumping provision for which consists of 4 chain pumps, 7 in. diameter, and 4 hand pumps 6 in. diameter, employing, when at work, from 120 to 140 men: the united areas of these 8 pumps is 267 in.; while four 10 inch pumps upon the patent principle, with a united area of 314 in., could be easily worked by about 16 men, and the same extraordinary proportion would exist in every ship, whether in the navy or in the commercial marine. Nor would this increase of power be the only advantage. One frightful evil in all ships' pumps is, their liability to be choked, by rubbish *getting into them. In the* case of the *ship Erin go bragh,* from Quebec to Liverpool, as noticed in the morning papers of the 16th and 17th December, 1841:—"The extremity of this vessel was so great that she sank immediately after the packet ship *Roscius* had been the happy means of saving the captain, crew, and one passenger. She was laden with flour and grain, the latter having *choked the pumps.*" This, unfortunately, is not a solitary instance of loss at sea, arising from the inadequacy and incapacity of the pumping provision, particularly instanced in the liability of the pumps to choke. Now it is a prominent feature of the patent pumps that *they cannot choke.* There are no valves to be so affected; while at every stroke, both the piston and clack clear themselves, and allow any extraneous matter that has got into the barrel to be discharged.

In these collective points of view, these pumps will recommend themselves in all mining and pumping operations where durability and increase of power are desired, and in all manufactories, particularly in those where liquids of a high temperature are to be raised, and sugar works in the colonies where the cleanness of the pump, and its freedom from destruction and choking are considerations.

To navigators, contractors, quarrymen, &c., having much water to get rid of but no great height to deliver it, these pumps would be an enormous saving, since hand pumps, with a short lift, could be made of a large diameter. One man, for instance, might work a 15 in. pump, the lift not being more than 3 or 4 feet.

67, Mark Lane, December 17, 1841.

Description of the Engravings.

Fig. 1. Is a plan of the piston, a section of which is shown by Figs. 3 and 4. A B the major, C D the minor diameter. R is the joint, (by which the pump-rod P is secured) the centre of which is in the true line of the major diameter A B, but neither in the centre of the pump or piston; being removed therefrom more or less as the diameter of the pump, the altitude of the column of water lifted, and other circumstances, may require. The whole area of the piston is therefore divided into two unequal areas.

Fig. 2. Is a plan of the lower valves, which is fixed in the barrel by means of the axle O, the eccentricity of which is regulated upon the same principle as

that of the joint in the upper valve or piston.

Fig. 3. Shows the relative position of the piston and valve during the upward or effective stroke.

Fig. 4. The same in the downward, or return stroke.

ANCIENT COMBINATION LOCK.

Sir,—Perhaps the following description of a well-known lock of combinations may interest some of the readers of the *Mechanics' Magazine*. It has been translated by a friend from the old German work from which I have already furnished you with some extracts. The work itself bears date 1636, and in the account of this lock you will observe that reference is made to a still older work. Few who possess the lock are, perhaps, aware of its antiquity.

I am, Sir, with respect,

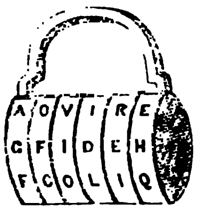
Yours, &c.,

U. S. HEINEKEN.

Sidmouth, November 27, 1841.

Of a Lock without a Key.

Gustavus Selenus, in his *Cryptographia*, p. 489, explains, from Cardanus Johannes Butens and Johannes Jacobus Weckerus, how to make a lock which may be opened and shut without a key; and as such locks are common, both in our own and foreign countries, I will endeavour to explain in this place how they ought to be prepared, but at the same time refer the readers to the above-mentioned authors. The form of the lock is this, (see figure, a fac-simile of the original.)



But we will teach from Gustavus Selenus a table by which such a lock may be opened. Such locks have generally four moveable rings, whereupon all manner of letters are engraved, and a certain name as Rudolf, Petrus, Ursula, or other such names which have six letters. Now, *one may change the letters of such a lock 1296 times. But in order that the change* may be rightly understood, we will, as we have said, give instructions how to make a table. And, first, we will suppose that there is only one ring; afterwards, two; and then, three; and lastly, four. But we will show it, not by transposition of the letters which are graven upon the lock, but by means of numbers. They shall have, then, the numbers 1, 2, 3, 4, 5, 6. If there were only one ring, a table of six numbers would be enough; if the lock has two moveable rings, there would be thirty-six changes, as is seen from the annexed table; with three rings, the table would be made from the second table, by setting them after one another in rows, six times, and then before the first rows to place 1, before the second, 2; before the third, 3; before the fourth, 4; before the fifth, 5; and, lastly, before the sixth, 6. Thus, there are 216 rows. Lastly, suppose the lock to have four rings: the table would be made from the third, by placing it six times, as by — (?) the others; and before the first rank, every time, put 1; before the second, 2; before the third, 3; and so on with the fourth, fifth, and sixth. Then such a table will comprise 1296 changes. So, when the lock has five moveable rings, the table must be made from the preceding rings, and will produce 7,776 changes; for 6 multiplied into 6 will produce 36, and 6 times 36 = 216; again, 6 times 216 = 1,296; and, lastly, 6 times 1,296 = 7,776. The sixth table would have 46,656 changes. I will here subjoin a table with three rings, (as the table with four rings may be easily made from it,) in order that this proposition may not become too long. (See Table I.)

As we have said above, that we have used the numbers instead of the letters graven on the lock, it follows how the preceding numbers may be expressed by letters. Let us suppose that in the fourth table the first ring has six letters, O F C S D A, the second ring O T O A E M, the third T D L N V A, the fourth R E T A S T; and, preserving these four arrangements, let such letters be represented by one of the numbers 1 2 3 4 5 6, in any order that you please, in the manner in which the following table is made. (See Table II.) Thus, if one reads the rows one after the other, from top to bottom, you have the six words, O V T R, F T D E, C O L T, S A N A, D E U S, A M A T. Now, in the

fourth table, these words will be represented by the numbers 1 3 6 4, 3 4 1 1, 2 5 2 5, 6 2 4 3, 5 1 5 6, 4 6 3 2. One can also, by another arrangement of letters, find other words upon the ring, as F T A T, S T L E, D T V T, A U L A, to which will answer the numbers 3 4 3 2, 6 4 2 1, 5 4 5 5, 4 3 2 3. Now, he who wishes to open the lock, and does not know the name on it, must try every arrangement, one after the other, from the table, and at every arrangement draw the upper part of the lock towards the right-hand, until it comes out, and the opening of the lock must certainly follow.

Q. E. D.

[From *Schweuter's Deliciæ Physico-Mathematicæ*, 1636.]

TABLE I.

1	11	111	211	311	411	511	611
2	12	112	212	312	412	512	612
3	13	113	213	313	413	513	613
4	14	114	214	314	414	514	614
5	15	115	215	315	415	515	615
6	16	116	216	316	416	516	616
	21	121	221	321	421	521	621
	22	122	222	322	422	522	622
	23	123	223	323	423	523	623
	24	124	224	324	424	524	624
	25	125	225	325	425	525	625
	26	126	226	326	426	526	626
	31	131	231	331	431	531	631
	32	132	232	332	432	532	632
	32	133	233	333	433	533	633
	34	134	234	334	434	534	634
	35	135	235	335	435	535	635
	36	136	236	336	436	536	636
	41	141	241	341	441	541	641
	42	142	242	342	442	542	642
	43	143	243	343	443	543	643
	44	144	244	344	444	544	644
	45	145	245	345	445	545	645
	46	146	246	346	446	546	646
	51	151	251	351	451	551	651
	52	152	252	352	452	552	652
	53	153	253	353	453	553	653
	54	154	254	354	454	554	654
	55	155	255	355	455	555	655
	56	156	256	356	456	556	656
	61	161	261	361	461	561	661
	62	162	262	362	462	562	662
	63	163	263	363	463	563	663
	64	164	264	364	464	564	664
	65	165	265	365	465	565	665
	66	*166*	*266*	*366*	*466*	*566*	666

TABLE II.

1	3	2	6	5	4
O	F	C	S	D	A
3	4	5	2	1	6
V	T	O	A	E	M
6	1	2	4	5	3
T	D	L	N	U	A
4	1	5	3	6	2
R	E	T	A	S	T

PRACTICE AND PRACTICIANS, *v.* MATHEMATICS AND MATHEMATICIANS.—MR. CHEVERTON ON S. Y.'S REJOINDER.

Sir,—I would gladly have been saved the necessity of making any remarks upon the last communication of your correspondent S. Y.; but it is impossible for me to be silent under the imputation of having myself written the censure which I lately quoted from the pages of your Magazine, as having been inflicted upon him, many years since, "by one who appears to have known him well."* I am not aware that my notions of what is fair dealing are too refined; but if I had really been the author of that censure, my writing respecting it in the manner I recently adopted would, in my estimation, have been nothing less than a deliberate falsehood. I must, however, do S. Y. the justice to admit, that he may not have viewed the imputation in this offensive light; for those blunted perceptions of what is just and right, which have enabled him without compunction to put forth gross and deliberate, because written, misrepresentations of another's opinions, may naturally enough incapacitate him from distinguishing clearly the respective boundaries of truth and mendacity.

I have no apology to offer S. Y. for the personality of my remarks: a writer who descends to the gross misrepresentations of which he has been guilty compromises his *character*, and therefore to

* The censure in question appeared in your third volume, at page 38, and the communication which contained it was signed, "James Yule, 63½, Red Lion-street, Clerkenwell." For myself, I know nothing of your correspondent S. Y., beyond what has appeared in the pages of your Magazine.

nce the one is necessarily to expose
ther. The *man and the manner*
e unavoidably, in this case, the
s of just reprehension; there is no
or discretion in the matter; and
h your correspondent may feelingly
ate such observations, as being
ertinent" and "irrelevant," which
ssuredly are in respect to an argu-
yet are they exceedingly to the
se in reproving a moral delinquency.
otions of pertinency and relevancy
r to accord with the practice of
g things upside down—he would
ne, I suppose, reason with, or defer
misrepresentation, but rebuke and
ish the argument. To enter into
sion with such a writer, on the
of the subject at issue, is quite out
question, even though his paper
en as full of argument as it is of
ception, perversion, and misrepre-
ion.

irous as you and your readers must
r, that a correspondence of this na-
hould speedily close, and in the
time be made as concise as possible,
fear it is demanded of me in jus-
hat I should cite one instance, at
of those misrepresentations of which
e accused your correspondent. I
elect one from his *last* communi-
, for it shows that the habit is in-
ible, at least while he continues
the shelter of an anonymous mask.
ys, "Mr. C. does his best to per-
[us] that the science which is more
l in its application, and more ex-
ely useful than any other, is a
us science; that it produces some-
worse than 'baneful effects,' &c."
mathematics a noxious science!
needs no other proof of misrepre-
ion—it is apparent on the very face
assertion; for who, that is removed
gree from an idiot, would express
n opinion, or venture to persuade
to adopt it? It is true, I have
the phrase "baneful effects," but
ader shall judge by the context
er it conveys the idea of the ma-
tics being in my opinion a noxious
e, or is calculated to impart that
sion to others. Alluding to, and
quently referring to, the commonly
ed mathematical formula for deter-
g the integral amount of the force
s during its expansion—referring
being founded exclusively on the
law of elasticity—referring to Mr. Pil-
brow's entire faith in it, as being a full,
instead of a partial and fallacious, mathe-
matical expression of the force developed
—referring to the new form of steam-
engine, which he had invented for the
purpose, (among other objects,) of ap-
propriating, as he conceived, to a much
greater extent than usual, the power to
be thence derived—and referring to the
sanguine, but deceptive expectations
which he, "as not being, perhaps, him-
self a mathematician," entertained on the
subject—I gave it as "an instance, not
at all uncommon, of the *baneful effects*
which a *blind indiscriminating admira-
tion* of the science, or even an imbibing
of the spirit of the science, has generally
upon our modes of thinking and reason-
ing."* And as an instance of the lu-
dicrous, rather than the baneful effects, of
imbibing the spirit of the science, in rea-
soning upon general topics to which it is
inapplicable, I gave the quotation from a
Poor-law Commissioner's Report. It will
be seen that "baneful effects" are not
here charged even upon the abuses and
misuses of the science, as they justly
might, without reproaching it as being a
noxious science; but they are described
as flowing from "a blind indiscriminat-
ing admiration" of it, or from an im-
bibing of the spirit of it, in the treatment
of matters to which it is alien. A more
disgraceful misrepresentation, therefore,
of a writer's opinions, than that of which
I complain, has never appeared in the
pages of your Magazine. But suppose
that, by a slip of the pen, or from a care-
lessness or a difficulty in turning an ex-
pression, a qualifying remark should on
any occasion be unfortunately omitted,
but which in the present case did not
occur, what can be thought of that man
who would fasten upon a phrase an opi-
nion which he cannot but know is not
only contrary to the spirit of the article
criticised, but is disclaimed by the writer
of it in express terms? My words were
these—"I cannot think that the *candid*
reader will infer, from what I have
written, that I am insensible to the real

* I had intended to give an instance of the baneful effects to which I here allude, as arising from the mathematical spirit in which subjects belonging to moral philosophy are often treated, and in which the reasoning concerning them is often conducted; but I find my thoughts have extended to too great a length for insertion in the same number with the present paper.

value of the mathematics, as displayed in its proper sphere; or even to the occasional and partial *utility* of its more mixed investigations, if used with proper reserve, and with strict subserviency to physical science;" and yet, in the face of such a declaration as this, your correspondent says, that I "do my best to persuade him and others that the mathematics is a *noxious* science"—and S. Y. is an honourable man! Sir, I shall not have written in vain, if an earnest denunciation of wilful misrepresentations should excite in the breasts of your readers such strong feelings, as to the moral obliquity which the practice involves, as shall secure for it on all occasions an indignant and deterring reprehension.

I conclude with one word to the general reader. It may by some be thought superfluous to descant on the abuses of a subject: so it would, if they were generally recognised as such; but the misfortune is, that they are perpetuated precisely because, the mask not being taken off, they pass current as the proper use of things.

I am, Sir, yours, &c.,
BENJAMIN CHEVERTON.

P.S.—As the opportunity offers, I may as well avail myself of it to correct a very amusing misconception (nothing worse) which S. Y. entertains of the class of men to which I refer by the designation of "Practicians." He actually appropriates it to himself and the operative mechanics, and very modestly declines the praise which I have bestowed on "practical men," "practical talents," "practical processes," and "practical methods of investigation." Nay, he says that his is "the less educated class;" and he cannot think of admitting, what he imagines I have been doing my best to persuade them, that his, "the less educated class, is the superior of the two"—the two being the working men and the mathematicians! I should have as soon thought of calling the manufacturing chemists, who furnish our laboratories with potassium and sodium, *philosophers*, on the strength of the discovery of those metals by Sir Humphry Davy having justly entitled *him* to that appellation, as of bestowing on our worthy and industrious artisans the honour and praise which belong to a Brindley, a Smeaton, a Watt, a Rennie, and a Telford. These were "practical men," but they were men whose shoe-latchets few of our mathematicians were worthy to unloose—men, whose fame will descend to all times, and in respect of whom, or at least of one of them, whose fortune was no bar, Arago has said, that it is a reproach to the nation he was not raised to the peerage. Of the same class, though possibly of a lower grade, are the men whose practical talents have originated, and brought successfully into action, the various enterprises which characterise our times. Take, for instance, the projectors of steam navigation; and, for a late example, the parties whose practical acumen and professional skill have contributed, in any department, to the success of the *Great Western* steam-ship. It is to directing minds like these that the terms "practical talents," and "practical men," are applied, by every one who understands what he is talking about; but your acute correspondent, S. Y., it appears, has been dreaming all along that they refer—in the case of the *Great Western*, for example, to the shipwrights, the "engineers," and the stokers employed—to the last class of men especially, for they are more "eminently practical," that is to say, harder working, than any of the others.—B. C.

LEWIS'S PARALLEL MOTION FOR PUMP WORK.

[Registered pursuant to Act of Parliament.]

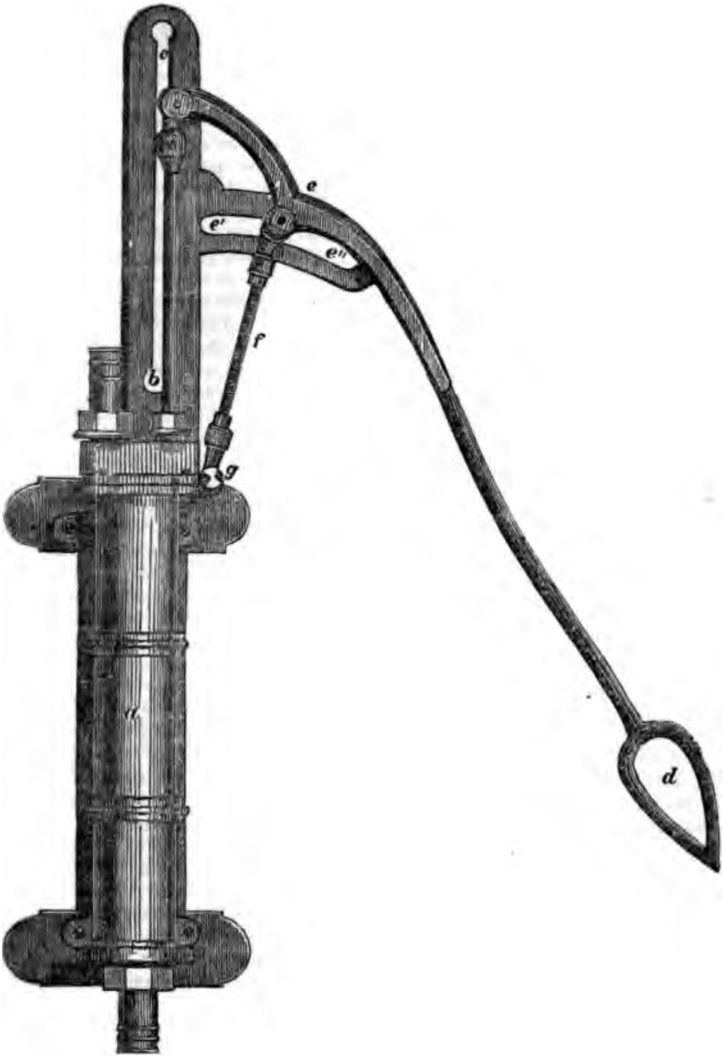
The annexed engraving exhibits a lifting force-pump recently designed by Messrs. Lewis and Co., of Stangate-street, in which they have introduced a novel substitute for the slings and guides heretofore employed for preserving the parallelism of the piston-rod. The novelty of this arrangement consists in the employment of a movable fulcrum, which describes the arc of a circle, while the piston-rod, and the end of the lever or handle to which it is attached, moves up and down in a straight line.

In the illustrative engraving, *a* is the working barrel of a lifting force-pump; *b*, the piston-rod, attached directly to the lever or handle *c d*, at *c*, and furnished with an anti-friction roller, which works in a slot formed in the upper limb of the pump-frame or standard. *e* is the ful-

crum of the handle bearing on the fulcrum-rod *f*, which rod works upon a joint affixed to the standard at *g*.

On working the handle *d*, the top of the piston-rod moves up and down perpendicularly in the line *b c*, while the fulcrum *e* describes the arc *e' e''*.

By means of this arrangement, the



height of the pump is reduced full one-third; *and its compactness is still further increased by throwing the piston-rod a little out of the centre, so as to get its* stuffing-box, as well as the rising main, both within the space of the pump-barrel. There are only two valves employed this pump, viz., one in the piston

bucket, and the other at the bottom of the barrel; the latter of which is so ingeniously arranged, as to be accessible and removable at pleasure, by merely unscrewing the union joint which connects the pump with its feed-pipe. The action of this pump is remarkably pleasant and easy, and its compact form recommends it as peculiarly adapted for situations where saving of room is an object; while, by the addition of an air-vessel, it is at once converted into an efficient fire pump.

Although shown as applied to a lifting pump, this motion is equally applicable to a forcing pump, by changing the lever from one of the first to one of the second order.

ON THE PROTECTION OF MANUFACTORIES, ETC. FROM FIRE.

Sir,—I have perused with much gratification the "Practical Suggestions for the Protection or Manufactories from Fire," at page 2 of your 960th number; if the same quantity of forethought and prudence exhibited by "A Manufacturer" were generally found to prevail, the entire character of London fires would be completely changed. His narrative clearly shows at how trifling expense an efficient safeguard against fire can be provided.

If the subject of fire were one more generally attended to, the present mass of ignorance respecting the best means of suppressing it, would soon give way to better notions. That water will extinguish fire, is admitted on all hands: but the necessity for providing water, or taking any measures towards its efficient application, seems to be a matter altogether beyond ordinary apprehension. Even the power of the one element to subdue the other, is very imfectly understood, and hence results incalculable mischief. Few persons have any idea of the small quantity of water that will suffice to stop the early progress of a fire. Let but the burning surface be covered with a film of water, no matter how thin, and combustion is at an end. By mechanical aids a single teacup-full of water may be made to cover upwards of six square feet, and therefore, to *extinguish that quantity of burning material.*

Mr. Loudon, in his Suburban Gardener, directs that "on the ground floor of a house, immediately within the outer door, one of Read's syringes (or some other equally efficacious) ought to be kept, and every male person in the house instructed how to use it. Precautions of this kind are useful *as leading to habits of carefulness and forethought*, which, after all, are the surest means of preventing accidents by fire." Many a fire that might on its first discovery have been extinguished by a single bucket of water, has been permitted to rage unchecked until more powerful means could be brought to bear, by which time it has become altogether beyond suppression. The recent destruction by fire of the Derby Town Hall, is a remarkable case in point.

Even firemen, from not having a clear perception of the subject, are continually doing more damage with water than is done by the fire itself, by using the former in quantities greatly beyond the requirements of the case. There are few rooms, the surface of which could not be covered by a *few pints* of water, and the effect of bringing an ordinary fire-engine to bear upon an apartment in the manner usually done, is to drown it and all beneath. An ordinary fire-engine throws about one gallon of water at every stroke, and makes from 60 to 70 strokes per minute, so that in the space of a very few minutes, several hundred gallons of water are needlessly thrown into the room, drenching the lower part of the building.

We continually find that persons having large properties at stake, take no steps towards the protection of their premises, under the false impression, that this can only be accomplished by some powerful expedients provided at a great expense. The fact is, that, merely "*a pail of water under each workman's bench*," would in many cases have sufficed, and would in several instances, within my own knowledge, have been the means of saving thousands of pounds' worth of property. I have a model fire-engine of a very small size, which has on more than one occasion stopped the spread of fire, and saved property to a large amount.

A bucket, a syringe, or a pump of the smallest calibre, with capacity on the part of some one to make a prompt application of them, would in nine cases

n arrest the progress of incipient
tions, which, for want of such
pposition soon extend far beyond
rs of human skill.
ate Mr. Russell took great pains
luce the fire-pump, but he was
he originator nor improver of it.
ng force pump fitted with an air-
ad been used as a fire-engine
century before Mr. Russell's
d is an article that has been re-
upplied by all engine and pump
or many years.
take too often prevails in fixing
mps; they should invariably be
vith the handle at least, *outside*
nises, and not within. Astley's
vas provided with a pump of this
ich, if it had been placed exter-
ould most likely have saved it;
g placed within the building, no
had courage enough to stand
smoke to work it, and the fire-
forced to drop the branch and
asty retreat.
e there is a well, or wherever a
nk can be sunk and connected
e certain supply of water, a fire-
invaluable. It should be en-
ithin a strong casing to protect it
st, from dust, and from wanton
one length of hose should al-
attached to the nosel of the pump
the water is used for ordinary
,) and two or three lengths more
should be coiled on a hose-reel
he casing of the pump. Above
branch pipe should be provided
preader, in order to produce the
water, of which I have before
and by which so large a surface
covered with the smallest quan-
ater.
pose at some convenient oppor-
o make a further practical appli-
f some of the points herein al-
, which time will not permit me
present, and remain,
ry respectfully, yours,

WM. BADDELEY.

ed-street, Islington, January 7, 1841.

PREVENTION OF FIRES.

-The observations of your inde-
and sagacious correspondent,
ddeley, on the efficiency, or in-
y of fire-engines, the supply of
c. &c., are very cogent, as is
every thing he writes. But I would wish to draw his very valuable attention to the old axiom, that "*prevention is far better than cure.*" Now, the "prevention" of houses taking fire was mainly and very effectually invented fifty years (?) ago, by the very intelligent Mr. Hartley, who, in conjunction with Sir Joseph Banks, constructed a house on Wimbledon-common, which still exists in perfect repair. The propinquity of this house has latterly been remarkable for several fatal duels. But to the purpose of *prevention* from fire. We have no word like the French "*incendie,*" to signify the burning of a house, &c. Our word "fire" applies to the fire in the kitchen, parlour, &c.; but let that pass—to the purpose of this note. Mr. Hartley covered the ceilings of his rooms with very thin sheet-iron, and in some cases the sides and floors. This is cheaper than lath and plaster, or handsome paper. The iron "*Latine plate*" can be painted any colour or pattern, and will resist all damp far better than plaster and paper. Pulled off one wall, it is as good as new to put on to another; in fact, if both sides of the plates be protected from the damp, by coal-tar or varnish, they must last to "the end of the world." The best adjunct to this very excellent and perfect preventive from fire of Mr. Hartley's would be, the proposal I published, many years ago, in your invaluable Magazine, *i. e.* to construct the stairs of houses (when not of stone,) of iron. Sheet-iron for the steps; cast-iron for the balusters and supportings. But this, although at least as cheap as deal wood, will be opposed by the deal-mongers, who, of course, rejoice in the burning of deal houses and their inhabitants! In the course of three years, the two houses of Parliament, six great mansions, and, I understand, the Royal Exchange and Tower armoury, have been consumed, owing to fire-flues being in contact with wood!! Now, a wise legislature would certainly inflict the very highest penalty of the law, whether death or transportation for life, on any architect or builder guilty of so stupid and reckless a conjunction! There is now a "*Fire Preventive Company,*" of which I shall send you an account, when I can get at my papers. *A patent* for putting plaster on the walls of rooms! Ridiculous! Plaster made of Roman cement and size! A

combination I recommended in your Magazine in 1825. Are not 99 rooms out of 100 covered with plaster? The floors of our flimsily-built houses would not retain a coating of plaster, without its cracking to pieces in a week.

There is another point on the subject of *prevention* of house-burning which I will briefly mention. In the luminous, well-arranged, and comprehensive statistical account of the fires of London, yearly furnished to your Magazine by your benevolent Mr. Baddeley, it appears that the greater number of fires occur in the houses of licensed victuallers, *i. e.* public-houses. Now, our legislators are ever and anon exercising their legislative wisdom upon the publicans whom, it appears, they take to be the greatest "*sinners*" in the community. I find that numerous fires occur from the contact of a candle with the bed-curtains, or window-curtains. Now, a good *preventive* law would be, to oblige all hotels and public-houses to have their curtains of any stuff, except cotton or linen. Wool and silk will not break out into a flame. It is useless saying that people *should not* read in bed, or place their candle on a dressing-table close to a curtain. They very often do so, and we see the consequences.

To those who cannot afford to change their cotton curtains for woollen or silk, I will suggest a sure preventive. After the curtains are washed, steep them in a solution of one pound of alum in one gallon, or rather more, of warm water; then hang them up to dry, after being wrung in the usual way. The same alum-water will do again—but alum is cheap.

Although my friend Mr. Hartley, the nephew of the inventor and the constructor of the fire-proof house on Wimbledon-common, has lately published a comprehensive pamphlet on the conclusive experiments made in his uncle's house, such as piling faggots on the floors, six feet high, so as to cause a most intense fire, impinging on the ceilings, without either these, or the floors, or walls, being in the least injured, no attention has been paid by the public to so important an expedient. I will endeavour to send you a copy of this pamphlet, out of which you will, perhaps, be disposed to give some extracts to the public. I remember that, some years ago, Mr. Baddeley reiterated the sheet-iron suggestion and *practice* of Mr. Hartley; but I was sorry to see that so sagacious a philosopher should have hinted that a ceiling of lath and plaster would resist fire nearly as well as the iron plates. I have repeatedly found, that beams of wood may be charred by fire, through iron plates; but it will not break into a flame, without the admission of a current of air.

"Prevention is better than cure" is, in the case of fires, the motto of, Sir,

Your obedient servant,

MACERONI.

1, St. Martin's-place, Trafalgar-square.
January 10, 1842.

MATTER AND SPACE.

Sir,—Permit me to make a few remarks, in reply to those of your correspondent "E.A.M.," on a paper of mine, inserted in the *Mechanics' Magazine* last December.

I can see nothing likely to appear "disputable" in the term *medium of space:* it clearly designates locality and universality, and leaves its general utility inferable: whereas, "firmamental fluid" implies something of limited location and service. The firmament was made "to divide the waters from the waters"—"to divide the waters which were under the firmament from the waters which were above the firmament; and God called the firmament heaven." At present we know of nothing which agrees with the above description of firmament, but the atmosphere, which in no sense can be considered, like the medium of space, a universal cause.

I am much at a loss to understand what "E. A. M." means by a *freezing principle.* "Is not the medium of space the freezing principle, so long inquired about by philosophers?" A freezing element, or cause, is certainly more intelligible. The medium of space, by its pressure, expands water during congelation; it also expands water to overflowing of the vessel on a fire during ebullition. Its office is to move, expand, and to compress; and wherever these phenomena obtain, it is the cause. The material world has no other cause of action and effect. A freezing principle is as foreign to nature as a heating principle. Each phenomenon has its theory.

"E. A. M." asks, "Would it be pos-

for motion to occur within the me- of space, if it did not itself under- :hemical change ? " Does this mean a body cannot have motion in a fluid s the fluid be acid or alkaline? ain of shot descends, and a piece of ascends, through every kind of ous fluid; even through quicksilver, ascends. If density be implied, tary motion would be maintained, present, were the medium of space f gold, and were impulse, as in all of motion, constant and greater than ance. Besides, the medium of space iform,—motion a mere mechanical :; and chemical qualities and chemi- hange are but adopted expressions, entional terms, which belong to the ical art only. Mechanical nature s nothing, includes nothing, needs ng of chemical matter, chemical erties, or chemical qualities.

The friction attendant on *life*," being le of producing *this* chemical or ical change which would permit n through the medium of space, is too new, indeed, to be comprehend- its origin. It may, however, be l, did not the earth perform its mo- as regularly before the creation of as now it does with 800,000,000 man beings on its surface incessantly ioning about; or, to be within the s of history, were the earth's motions e least affected when all mankind, ight, were destroyed by the deluge? boast nothing of super-astronomical ledge, I must beg information, how ery *movement of animal life* tends to ote the circulation of the universe." Heat and cold are, as every one rs, sensations: but are caused by rent *dispositions* of matter." Then re to be wished, the chemist would what it really is which boils, and congeals, water, instead of mislead- he world by attributing boiling to the ation, heat—freezing to the sensa- cold; and otherwise, all modern phi- hy sayeth not, as to how these phe- ena are to take place. Different *positions of matter*" causing heat cold, is open to any kind of interpre- so vague is the expression. How- , "E. A. M." admits, that physical and physical cold are wholly out of question. Still, I imagine, some con- *ing or corroding ability possessed by some innate essential ability* where- by matter acts on matter is meant, but which cannot be correct. The atoms of matter and bodies are *inert*, therefore possess no self-acting ability whatever: they are unalterable, therefore are at this day the same in substance, size, shape, and essence, as the moment they were created; and bodies formed of them are as incapable of change from cold to hot, from hot to cold, from insipid to acidulous, as their inertia indicates, which includes unchangeability, and inertia is the zero of cause. Whatever is effected by fire, is effected only mechanically; nor is there in nature any but mechanical cause, mechanical effect, and mechanical result. The sensations which bodies promote seem to belong to those bodies; and thus is the simplicity of nature most strongly evinced in our being supplied, in sensations, with light, heat, cold, sound, acidity, and every thing our mind knows, without any thing similar belonging to the material world. Heat being admitted to be a sensation, what can "E. A. M." mean by "the sensation being caused by the motion of matter in the *form* of heat?" Shape and feeling are vastly different things.

The nervous fluid is the cerebral sense exciting cause in every instance, no matter what may be the resulting sensation. The medium of space is continuous from without through the nerves of sensation to the brain, and within the nerves it is the nervous fluid. As its pressure on the brain, promoted by external circumstances, increases, so is the sensation, heat, excited and increased; when the pressure is intense, the sensation is pain accompanied with rupture of blood-vessels; and as the pressure declines to the minimum, the sensation is cold, colder, and painfully cold. I would ask "E.A. M.," from having granted that heat and cold are but sensations, how "cold is caused by the presence of more of the medium of space than the vital energy can convert into heat?"—into the *nonentity* heat, or even the sensation, it being impossible, by all the energies of nature, to convert matter from what it is, to any state it is not, but as respects rest, motion, or locality.

All sensations are the mental result of the pressure, and degrees of pressure, of that portion of the medium of space which forms the contents of the nerves of sensation, on the respective organs of the

brain. "Recollection of a sensation," of pain, for instance, is not a sensation.

"E. A. M." is perfectly correct, if, in saying, that, "a white leaf and a black dye might express all the wonders of creation," is to be understood, that the theory of nature is so simple, any single phenomenon comprehended fully makes known the general theory. For, however diversified are nature's mechanical performances, (made tenfold so, to us, by the sensations they promote,) how far from complex must be the theory of a procedure, however universal, which has for substance only inert homogeneous atoms; and for cause, only pressure emanating from the general construction.

T. H. PASLEY.

Jersey, January 8, 1842.

ON MR. R. ARMSTRONG'S NEW THEORY OF DIFFUSION. BY C. W. WILLIAMS, ESQ.

Sir,—As you have given the publicity which your columns ever secure, to Mr. R. Armstrong's new and ingenious illustration of Dr. Dalton's theory of the peculiar manner in which gaseous bodies intermingle, termed, their "diffusion;" and as Mr. A. has demonstrated, (to his own satisfaction, at least,) in the working of Mr. R. Cheetham's smoke-burning patent, that Dr. Dalton's system of the diffusion of gases, *inter se*, means, in fact, their absolute *separation* from each other, it will be at least curious to know how this very original conception of the process of "diffusion" is made out and applied.

I have said, this new theory of Mr. A. is *ingenious;* indeed, I can only compare it to the process by which the philosopher would explain to the Prince of Abyssinia how to extract sun-beams from cucumbers. All that was wanting to *prove* Mr. Armstrong's theory, (and which I have no doubt he will supply, *suo more*,) was, to have added an algebraic formula, thus to establish the fact, that it was "mathematically correct."

Mr. A. tells us, that "it was with peculiar pleasure he *lately* heard" (three years ago this patent was explained in Mr. A.'s own book,) "of a most interesting application of chemical laws, in the newly-discovered process for burning smoke and economizing fuel, by Mr. Cheetham, by which those two important objects are effected in a manner far superior to any thing of the kind that has ever been seen before." The "particular chemical laws thus applied" being those of Dr. Dalton, relating to the diffusion of gases! And now for the theory and its application. Mr. Cheetham's plan, Mr. A. tells us, "consists in the compelling all, or most, of the carburetted hydrogen and other combustible gases, which escape inflammation, when first generated from the crude coal in the furnace, to *return again*, and pass through the fire, where they are converted into flame."

I would here stop just to ask a simple question, whether it might not be as well to effect the combustion of these gases at once, and by *a single operation*, thus avoiding the *second* circuit of the furnace and flues? The only reason which suggests itself for this burning but one portion of those gases in the first instance, and then ingeniously bringing the other portion round again by the circulating process is, that if all had been burned at the first operation, then would there have been no need or application for the new theory; for theories, as well as candles, were not invented to be put under bushels.

Mr. A. then informs us, that this process is effected by a very simple apparatus, namely, by a "small rotary fan, in connexion with that part of the flue through which the smoke is passing off to the chimney, after having left the boiler." I would here again ask, why make this smoke at all? and why burthen the flues and the boiler with this second current of so bad a heat conductor as smoke or soot? Except, indeed, for the pleasure of illustrating the new theory.

We are then told that the fan "*exhausts* the smoke from the smoke-flue, and propels it, by a return flue, to the inclosed ash-pit, whence it is forced through the fire-grate, where combustion (of this smoke) is effected, and the products of this *second combustion* (second combustion!) again passes under and around the boiler, and then up the chimney." A casual observer would here ask, how this smoke, so exhausted from the smoke-flue, after the *first* and *second* processes, and after having made this second circuit round the boiler, is prevented from making a *third* circuit along the same ground; and, in fact, making a sort of squirrel-cage move-

ment? Luckily, Dr. Dalton's theory thus explains this apparent anomaly, according to Mr. Armstrong's new version; for he would prove, that the smoke and unconsumed combustible gases, after having passed round the boiler, and being intermingled and diffused, under the Daltonian theory, are, by the magic peculiarity of a fan, and at the very same time, *separated*, (as chaff is from wheat,) the useless and incombustible gases alone passing up the chimney, while the combustible portion, thus miraculously *separated* under this diffuso-separative process, returns again, (under said squirrel system,) to the ash-pit, furnace, flues, and boiler. Thus we find that Dr. Dalton's theory of the intimate intermixture and diffusion of gaseous bodies without reference to their respective specific gravities, (long since admitted to be correct by the whole chemical world,) is now, by the new light chemistry of Mr. Armstrong, discovered to possess the additional peculiarity of separating the combustible from the incombustible gases, just at the moment when, by the same laws, they had become intimately diffused among each other. To this, however, must be added the peculiar action of a fan, which, also acting in a double capacity, propels the useless gases up the chimney, and sends the useful ones round again to the furnace! Who will hereafter despair of impossibilities?

Mr. A. observes, "your chemical readers" (doubtless he thought it was too profound for mechanical ones,) "will be aware that this *circulatory* process cannot go on without atmospheric air, and which air is admitted by a small aperture between the fan and the smoke-flue." How this *small* aperture can admit 360,000 cubic feet of air for each ton of coals, the theory sayeth not.

Mr. A. observes, "It was demonstrated by Dr. Dalton, that different gases act as *vacua* to each other, while Professor Graham has shown that the different gases have a tendency to diffuse into each other with different degrees of rapidity, which bears a certain relation to their specific gravity; and *hence* he, (Professor Graham,) shows that, by availing ourselves of this tendency in mixed gases, a sort of *mechanical separation* of the various gases may be effected." Here is a flight of philosophic ingenuity, with a vengeance! What will Professor Graham say of this "mechanical separation," thus attributed to his idea of the "tendency of gases to diffuse into each other?"

But, lest any doubt should remain on the subject, we are told in plain English, "it is precisely this *separation*," (after the previous diffusion,) "that is effected by Mr. Cheetham's process." How far Mr. C. may feel obliged to his eulogist, for this explanation of the process, I leave to him to say.

Now, the ingenuity of this philosophical diffusion-separation process reminds one strongly of the philosopher, (Swift's, I believe,) who suggested an equally ingenious mode of producing a diffusion of talent and temperament in the human species. His plan was, the taking a slice off the brain of the sanguine man, and exchanging it for a slice from the brain of the phlegmatic—thus virtually reconciling diffusion with separation. Equally ingenious, and equally practicable and valuable, is this with Mr. Armstrong's separation-diffusion theory.

(To be concluded in our next.)

PECULIAR CASE OF OXYDATION.

Sir,—Will you permit me, through your pages, to ask advice of some of your readers under the following circumstances:

I have a carpenter's stove for steaming plank in, which, when fully exposed to the atmosphere, I found the steam to condense so rapidly, as very much to lessen its utility. To counteract the speedy cooling I had it cased with plank on the outside of the flanges, by which its separate pieces are secured together, and the space between, say 2 inches, filled with sawdust: this effectually prevented condensation, and, as I fancied, answered my purpose; but on renewing a part of the casing after six months use, I found the stove rusted $\frac{1}{16}$th, or upwards, of an inch, and the decay apparently going on. Now, at this rate, it will very soon be holed through, and if some of your correspondents would, through the *Mechanics' Magazine*, favour me with advice, they would much oblige,

Your obedient servant,

A Constant Reader.

Glasgow, January 13, 1842.

ICE VELOCIPEDE

Fig. 1.

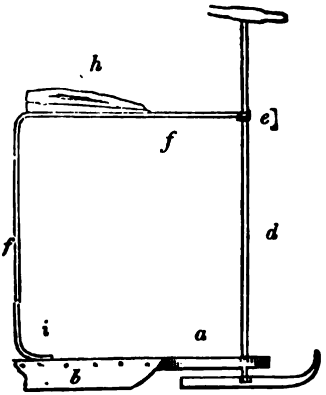


Fig. 2.

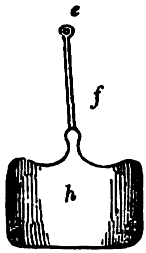
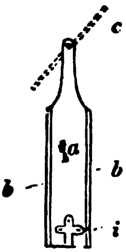


Fig. 3.



Sir,—If you think a description of the little vehicle named and sketched above worthy of a place in the pages of your Magazine, it is at your service.

I will only premise that I have made one, and found it to answer extremely well.

a, figs. 1 and 3, is a piece of board, 1 in. thick, 4 in. wide, and 18 in. long, made of the shape shown in fig. 3.

b b, two runners, made of steel, ¼ in. thick, 2½ in. wide, 11 in. long, screwed to the sides of *a*.

c, the front runner, 1 in. wide, 10 in. long, turned up in front like a skate, and slightly curved at the bottom edge.

d, a rod of ⅜-inch round iron, made with a clip at the bottom, by which it is attached to the runner *c;* it works in a hole at the point of the board *a*, and has a small shoulder at *e*, where the seat-iron *f* works on it, and a thumb-nut at the top, to secure the handle *g*.

The seat-iron is of full ⅜-inch round iron, flattened at the seat part; and the seat, which is of the shape shown in fig. 2, is covered with cloth, and stuffed. There are spring keys at *e* and the point of *a*. The height from the ground to *e* is 2 ft. 4 in.; from *e* to *g*, 10 in.: the weight of the whole is under 12 lb.

The method of using needs no description; it being only necessary to wear coarse worsted hose over the boots, to prevent the feet from slipping on the ice.

I am, Sir,
Your obedient servant,
J. R.

Hastings, January 10, 1842.

THE CAP OR DEFLECTOR LAMP, COMMONLY CALLED THE SOLAR LAMP.

Sir,—Messrs. Timothy Smith and Sons, of Birmingham, have, it appears, under the pretence of replying to the statement of "A Constant Reader," introduced my name, telling your readers that they have commenced an action against me, for selling a patented invention of Mr. Young's, which they please to term an infringement of the patent of Mr. Jeremiah Bynner. As this assumed important intelligence has really nothing to do with the matter in dispute, and was evidently intended to divert inquiry from its proper object, I trust you will permit me to keep the point at issue in its right position, namely—does the cap or deflector, which is the sole distinction between the Solar and other lamps, make a prominent feature in the expired patent of Upton and Roberts? I assert it does; and, in proof, refer to the specification of that patent, in which two lamps are described, by drawings and in words, both having caps or deflectors identical with those used with the Solar Lamps. The lamps are Nos. 4 and 9, and the specification is at the Petty Bag Office, where it can be inspected by any one. A great number of the lamps referred to were made and sold during the term of

at, from 1827 to 1841. Many are now in use, in various parts and, and can be produced to r themselves. Besides what has ted, there is that which will, no e considered rather a peculiar a the case. Some hundreds of ps were made, in virtue of Upton erts's patent, by Messrs. Timothy d Sons, under the superintend- Mr. Jeremiah Bynner, who was ing as the foreman of Messrs. Lamp Factory, and this was at years before he obtained his This is rather a startling fact, surprise those who know what done to obtain a patent, whether your pages, or reserved for a law.

I have here stated, Sir, are ich I am prepared to substan- ey are facts which concern the nd give the free and immediate ese caps or deflectors to every Messrs. Smith are desirous of a statement, let them make one ill meet the point at issue. If t law are cited, let them be de- ies. The public are not, they assured, to be hoodwinked by e to an undecided action, which nothing, and may end, as such not unfrequently do, in stripping ty assailant, like the ass in the the lion's skin.

remain, Sir,

Your obedient servant

GEORGE UPTON.

r Office,
George-street, Hanover-square.
January 11, 1842.

ATE MAGNETIC DISTURBANCES.

he advance of knowledge, the value ne part of a theory may much out- e accompanying error; and the use e may be little impaired by its want city. The first steps of our pro- not lose their importance because not the last; and the outset of the may require no less vigour and ac- an its close."—*Whewell, Hist. In.* . 118.

-The remarkable magnetic dis- e at the Greenwich Observatory gaged my attention previously to nouncement of it *in your* last

An increased volcanic action, (aurora borealis,) has been occasionally observ- able at the north pole for a length of time. This has, of course, occasioned a great disruption of ice, and consequent approach of it towards the equator, the evaporation of which has filled the atmo- sphere with moisture. By the volcanic action of the 25th of September, the overloaded metallic fluids were shaken, and the additional moisture has been coming down ever since, like the drip- ping of an over-saturated sponge. It is not during the commencement of the derangement of the system that the pulse is the most affected, but at the crisis of the disorder. The liquid that is tranquil in the half-filled cup shakes on the brim. There can be no doubt that the sky, (the upper region of the atmosphere,) is the emporium of metal in a state of sublima- tion, or of electricity. To this metal moisture adheres. Look at a flake of snow—what else gives it its star-like form, with its serratures? I know not whether the geologist has ever thought of tracing his metallic veins to the sky— if he have not, behold a theory for him, worthy of his deepest consideration. I have another theory for him, on the sub- ject of coral rocks. All in good time.

"In the next place," says the same learned authority from whom the prefixed motto is taken, "we may venture to say, that ad- vances in knowledge are not commonly made without the previous exercise of some boldness and science in guessing."—Vol. i. p. 411.

A blunderer is better than one who cannot guess at all, and who rests satis- fied with not knowing. I took it into my head, the other day, to place a great U before things unknown. What a number of U's! How many which there is no chance of expunging, while it is believed that matter can continue to move without a continuous force. Great a man as Newton undoubtedly was, "in sweep- ing the skies," he resembled "Dame Partington," or the silk-merchant who wanted to have all the silk-worms' eggs destroyed, because he found some moths amongst his cocoons. What had a moth's egg to do with silk? I have lately been told, that much of what I have brought forward is not new—that it *was* known to the ancient pagans. I know that: I know also that it is known to the pagans

of 1842. What of that? Do we not eat, drink, and sleep, as the pagans did, and do? Why should we not think as the pagans did, and do, in matters that do not interfere with our faith? It is just as absurd to think people are wrong in all things, as right in all things. The part of my Theory of the Universe* which I believe to be new is, that of the absorption of a universal fluid being the cause of the approach of solids to the earth—that the opposing currents of air are the cause of the approach of bodies without absorption—that there is positive cold, consisting of separate atoms, in a peculiar fluid—and that positive heat is a globular arrangement of the said atoms with the said fluid, the change being wrought through the medium of vegetable and animal existence, and that the continuance of all motion is due or caused by life. If this has all been made known before, I suppose the objection is also known. What is it?

I pretend to no more than a wish to make others see the beautiful view which I have seen. If any one is afraid of a "chamois-hunt," as Coleridge calls following a deep thinker, he can but turn back. I do not dispute the force of the attraction of a good fire, an easy chair, and a book. *Go back.* When Socrates was asked what he thought of the theories of Heraclitus? he replied, that "what he understood of them he found so clever, that he concluded what he did not understand was so likewise." *There* is a precedent for all philosophers. At any rate, he did not condemn what he did not comprehend.

In a former number of your Magazine, my attention was drawn to the subject of the growth of trees. Is it attraction that lifts those enormous masses above the earth? Yes—capillary attraction! What is capillary attraction? Something very different from any account of it that I have as yet seen, or I am much mistaken. Of this at another opportunity.

I remain, Sir, your obliged, &c.,

E. A. M.

January [illegible]

MR. PILBROW'S CONDENSING ENGINE.

Sir,—As Mr. Pilbrow has invited discussion on the merits of his condensing engine, I beg to offer a few observations on that part of it which appears to me most open to objection.

Mr. P., I think, overrates, in the first place, the perfectness of his vacuum as compared with that of the common engine. He says, speaking of the condenser of the common engine, that "all air and gas cannot be withdrawn at each stroke of the air-pump; half, at least, must remain in the separate condenser, which will expand and make the extreme vacuum less by 1lb." One might almost be led from this to suppose, that Mr. P. meant to say that all the air and gas given out *in the last condensement* cannot be withdrawn at one stroke of the air-pump, but that a portion of it remains to vitiate the vacuum. But what must be the inevitable result, if such were the case? Certainly this, that the air-pump being unable to withdraw *all* the air and gas given out at each condensement, that portion which is not so withdrawn, or remains behind in the condenser, must *continue to accumulate* until the vacuum become thoroughly vitiated. Mr. P. must perceive that such must be the result on the supposition stated; but as no such incremental accumulation of gases takes place in the condenser of the common engine, it follows that the air-pump does in fact withdraw all the air and gases given out in each condensement. A certain portion of air or gas no doubt always remains in the condenser, arising from the unlimited expansibility of gaseous bodies, and the consequent impossibility of any air-pump, however perfect, *completely* extracting it from a chamber which its own piston does not fill, and in which, therefore, it will find room to expand. It may, however, be attenuated to a certain point, and there is nothing in theory or practice, except in as far as arises from imperfection in construction, to prevent the air-pump of the common engine maintaining the vacuum at that limit. As the piston of Mr. P.'s condenser fills or traverses the whole internal space or chamber, it certainly expels every portion of air or gas from within, and his condenser is therefore free from the imperfection just adverted to in the condenser of the common engine; but it does not necessarily follow that in practice he obtains a better vacuum than that of the common engine; for there is another consideration to be taken into ac-

* See Mech. Mag. vols. xxxiv. and xxxv.

namely, the difference in size or y between the two condensers, and r the vacuum in his *comparatively* condenser may not be as much vi- t the end of each condensement as the common condenser, which is not in capacity like Mr. P.'s. Take te of the two condensers at the end condensement; and just before gine makes a new stroke. The n of the common condenser is l by the gases given out during ndensement just concluded, the due to the temperature of the sements, and that *constant* portion which the air-pump cannot with- but then these are diffused in a space or chamber. In Mr. P.'s ser—the vacuum is vitiated in like r by the gases given out during the sement just finished, and by the due to the temperature of the con- ents—being free, however, from *stant* portion of gas of the com- condenser; but then they are up and confined in a small or space; and it may be worth in- whether, under these circum- , their elasticity, or power of offer- istance to the piston of the engine, as great as in the common con- or, in other words, whether in e his vacuum is at all more perfect at of the common condenser.

main objection, however, to Mr. gine, and which will more than balance any advantages it may other respects over the common , is, the enormous resistance to it is subjected, *towards the end of roke*, by the pressure of the atmo- on such a large surface as the the condenser piston—a resistance added to the work performing by gine, may well nigh go to stagger ralyze its movement. I am un- perceive the soundness of Mr. soning on this point. He says, enormous burden thrown on my not an ounce, whether the con- ent is thrown out by a large area n and a short period of discharge, my engine,) or by a small area of and a long period of discharge, he present engine,) the total effect pressure of the atmosphere must same, the quantities being, as they , equal." In what respect are the quantities equal? The air-pump of the common engine is made of definite proportions, to effect a definite end—the expulsion of the gases and water which are found in the condenser at the end of each condensement; and that proportion is given to it which is just suitable to produce the result intended, and not more. The size of Mr. P.'s air-pump, or the area of his condenser piston, (which is the same thing,) is not made with reference, *primarily and only*, to the purpose of ejecting the gases and water resulting from each condensement, nor has it those proportions which would be given to it, if it had merely that end to fulfil. I cannot acquiesce in Mr. P.'s reasoning, that a large area of piston and short period of discharge necessarily come to the same thing as a small area and a long period of discharge, which is the inference deducible from his words in the quotation I have given. Enlarging the area of the piston does indeed defer and shorten the period of discharge; but, however much the area may be enlarged, a time must come, *though it be at the very end of the stroke*, when the condensements must be discharged, and the pressure of the atmosphere let in on the piston: yet I can hardly think that Mr. P. will assert that the total amount of pressure on the piston is still the same.

There are two things which, it appears to me, Mr. P. has not satisfactorily proved, and I submit them to his candid consideration.

1. That the total amount of pressure or resistance from the atmosphere on his condenser piston is the same as, or not greater than, the resistance of the same fluid on the piston of the air-pump of the common engine—the steam cylinders of both engines being in all respects alike.

2. Supposing the amount of pressure of the atmosphere to be the same in both, whether the accumulation of this resistance at the end of the stroke, *when the crank is in the worst possible position to carry on the movement of the engine*, is not far more prejudicial to its effective working, than the same resistance diffused over the whole, or a considerable portion of the stroke.

N. N. L.

January, 1842.

MECHANICAL CHIMNEY SWEEPING.

Sir,—Public attention has been very properly directed to a somewhat important matter in connexion with the forthcoming emancipation of the "little negroes of our own growth," by the notice which appeared at page 425 of your last volume.

The change which will then be *complete*, has already to a great extent taken place; *machines* are now become common, *children* scarce. Thanks to the indefatigable exertions of Mr. Stevens, and his humane coadjutors.

Lest the compulsory humanity which is now thrust upon us, should be productive of needless annoyance, I beg to add a few words for the guidance of housekeepers, on a point upon which they are open to deception.

There are at this time in use two kinds of machines for sweeping chimneys, known as Smart's and Glass's. The former consists of a number of short *inelastic* hollow rods fitting loosely one into the other, and connected by a rope passing through the whole. *Never employ any person who uses this machine.*

Glass's machine—which is sanctioned by parliament, and is the machine by which the perfect and efficient sweeping of chimneys by mechanical means was completely established—consists of a number of *elastic* bamboos firmly connected together by screwed ferule joints.* This machine is sufficiently pliable to sweep all ordinary chimneys, and with a little contrivance, every chimney in existence; while its firmness and stability enable the user to cleanse the chimney more effectually than boys have ever done.

Glass's, at present, is the only machine that can be depended upon; when chimneys require sweeping, therefore, see that this machine is employed: it differs so greatly from the other that there can be no mistake, and housekeepers may depend upon it, that those parties who will still continue to use the old inefficient machines, only do so for the purpose of causing annoyance and bringing mechanical chimney sweeping into disrepute, by showing how very badly chimneys can be swept by a bad machine, worked in the worst possible manner.

A slight attention to these points will ensure the efficient and cleanly execution of what has heretofore been very imperfectly accomplished by a very barbarous method.

I am, Sir,
Your obedient servant,
WM. BADDELEY.

January 3, 1842.

BLASTING ROCKS UNDER WATER BY GALVANIC IGNITION.—IMPROVED APPARATUS INVENTED BY DR. HARE.

[From the Franklin Journal.]

In Vol. xii. of the last series of this Journal, (page 221,*) we published an article by Professor Hare, describing an apparatus for the blasting of rocks by means of galvanic ignition; and it will be seen, by the subjoined letter, that Captain Paris, a well-known engineer and architect, of Boston, has applied the proposed means, with perfect success, in blasting rocks under water. In the article by Dr. Hare, Mr. Moses Shaw, of Nova Scotia, is mentioned as having first suggested the idea of igniting the powder in blasting rocks, by the aid of the electric fluid. That gentleman had pursued the subject with much persevering industry, contending, at the same time, against pecuniary difficulties, and a want of those resources which science alone can supply, in the prosecution of such undertakings. He well merits, however, to have his name associated with those who have brought the matter to a successful issue.—EDITOR.

Dear Sir,—Knowing the great interest you have always manifested in all engineering operations connected with the construction of public works, it affords me pleasure to communicate to you an account of the transactions within the past summer at this Navy-yard, in blasting rocks under water by means of the galvanic battery.

The application of this means to purposes of blasting is somewhat novel, as you are well aware, and the account of Colonel Pasley's experiments in England has given to the public the first notice of its being thus employed. Since the blowing up of the wreck of the Royal George, it has been successfully used in England in blasting rocks and clearing harbours, rivers, &c. from obstructions: it bids fair to entirely supersede the old methods of blasting, both in civil and military operations, especially in the latter, where it becomes a tremendous agent for the instantaneous explosion of mines, &c.

* Described with illustrated engravings, at page 184 of vol. ix.

* September, 1833.

In the detailed accounts of the experiments tried by Col. Pasley, it appears that at first many difficulties were encountered; and the numerous failures seemed to forbid any hope of success in large operations, although the result of those on a smaller scale generally proved satisfactory. Perseverance, however, enabled the operators, after many trials, to render the explosion of the charge under water as certain as by the ordinary methods on dry land; and the subsequent success in blowing up sunken wrecks, &c., at the bottom of the Medway river, and at Spithead, proved the utility of the means, and amply compensated for the labour and expense incurred in the first attempts.

Our operations during the past season were confined chiefly to the construction of quay walls and the foundations of two launching ways, the whole of which were built of stone. The character of the bottom of the river where the work was laid rendered blasting or other means necessary, before a proper surface for the foundation could be obtained; it was desirable to give it a slight inclination inwards, so that the face of each course of stone should lie somewhat higher than the inside, thus preserving a proper batter of the walls, and rendering them perfectly secure. This bottom is a hard slate rock, and, with the exception of some level portions, extremely uneven, with slopes of almost every grade, generally in an outward direction from the shore. The depth of water in the line of the walls varies from fifteen to twenty feet at low water, and from twenty-five to thirty below the high tides. This depth of water, added to a strong and variable current, caused me to anticipate much difficulty and great expense in all operations below its surface.

But we were, fortunately, provided with a fine diving apparatus, consisting of a cast-iron diving-bell, and a powerful air-pump attached. This apparatus was worked from a vessel of strong construction and light draught, fitted expressly for the purpose. A system of signals and messengers was established for communication between the workmen in the bell and those on board the vessel; by these means every want was speedily made known and answered. Four workmen, divided in two gangs, were employed for working in the bell, which made four descents per day, occupying at each time two and a half hours, the two gangs alternately relieving each other. The bell was amply supplied with a constant stream of fresh air, and but two or three inches of water remained in it at its greatest depth, so that the men worked in a comfortable state, perfectly dry, and with no more difficulty of respiration than on dry land.

In deciding upon the best means for preparing the bottom for the reception of the foundation of the walls, I was greatly at loss which to adopt. It appeared to me, that in adopting the method practised by Col. Pasley, great expense and difficulty would be incurred; and as it did not appear that this method had been employed in blasting the solid rock at the bottom of a river, in any of his experiments, I was somewhat apprehensive of its utility for operations of this kind, and whether the cost would justify the trial. In order to satisfy myself with regard to the expense of an experiment with the galvanic battery, I applied to Mr. Daniel Davies, junior, philosophical instrument maker, of Boston, for the necessary information, when I was convinced that a very trifling expense would procure such a trial as would satisfactorily decide the merits of the apparatus. Mr. Davis kindly assisted me in making the experiments which were tried at the Navy-yard at Charlestown, and I had the pleasure of witnessing the most satisfactory results, and without hesitation determined to apply the means to the work in hand.

The galvanic battery, which was constructed by Mr. Davis, was one of Dr. Hare's invention, of Philadelphia. It consists of two vessels or jars, each formed by two concentric cylinders of copper, admitting of a cylinder of zinc between. Two copper wires, termed the conducting wires, formed the medium by which the electrical fluid was communicated to the charge from the battery. These wires were closely wound with thread, in order to prevent their coming in contact with each other, and both tightly covered with tape, and afterwards served round with twine, thus forming a single coil. At each extremity of the coil the wires were separated for a few inches, like a fork. This form of the galvanic battery, termed by Dr. Hare, the "Calorimoter," is the most simple and portable of any that I have seen; its power for blasting gunpowder may be increased to any required degree, either by enlarging the size of the jars, or increasing their number. We had, in addition to this apparatus, a simple contrivance for proving the charges of powder, which is termed the "Electrometer."

The charges used in blasting consisted of various quantities of gunpowder, according to the effect required, from four ounces to a pound. They were enclosed in perfectly air-tight tin cannisters, the smallest being an inch and a quarter in diameter, and the diameter of the largest about two inches; the lengths of the cannisters were eight or nine inches. Two copper wires were introduced into the cannister, about half-way down, with the extremities connected by a fine platinum wire; the other ends of the wires pro-

jected twenty or twenty-five inches beyond the mouth of the cannister, which, after being filled with powder, was closed, and effectually secured with a water-proof composition. It will be observed, in thus preparing the charges, that the whole is completely air and water tight, and that no vent to the powder remains, an advantage of which I shall further speak.

The operation of blasting is carried on in the following manner. The hole in the rock for the reception of the charge is drilled to a proper depth by the workmen in the bell; the cannister is then inserted, with the ends of the copper wires extending outside of the hole, which is then filled up or tamped with coarse sand. The ends of the conducting wires are then connected, by means of clamps, to the wires leading from the charge; the other end of the coil is then led up, as the bell is hoisted to the surface, to the battery, which, in all our experiments, was placed on a floating stage directly over the charge. The jars forming the battery are brought near each other, and their whole power concentrated by connecting them together with a short copper wire; the end of one of the conducting wires is then brought in contact with one pole of the battery, and the end of the remaining wire similarly disposed with the other pole, when the explosion instantly follows, by the platinum wire in the charge becoming intensely heated as the electrical current passes through the conducting wires.

We made during the past season nine blasts, with but one failure, which was caused by the platinum wire in the charge becoming accidentally broken, so as to render the electrical circle incomplete; this probably occurred in tamping, an operation which must be conducted with care, as this accident is most liable to be incurred, of all others, owing to the extreme delicacy of the wire. The object of the electrometer is to detect whether this has taken place before the charge is inserted in the rock, and may always be ascertained by a simple trial.

It must be obvious to every one, at all experienced in blasting rocks, that this method has advantages, in many respects, over the old methods, both under and out of water. The danger of accidental explosions is entirely prevented; these occur, for the most part, in the old practice, by carelessness, while in this, great care and nicety are required to produce the explosion. There is very little time required in charging, as the cannister is simply inserted in the hole, and tamped with sand; the whole time occupied in this operation, and making the connexion with the conducting wires, in the present cases, rarely exceeded twenty minutes. There is great expense and trouble saved in the absence of the train or fuse, which was indispensable in the old methods, especially under water, where was always required a water-tight hose or tube leading to the surface, which was always destroyed by the explosion. Here nothing is lost or injured, except the cannister containing the charge. The explosion of the charge is reduced almost to certainty, and should cases of failure occur, it can be approached with safety, without the suspicion that fire may be near it. The most important advantage, in an economical view, is, that the effect of the charges is much greater than in the old way, in consequence of there being no vent-hole; the whole explosive force of the powder is thus gained, while by the old methods much of it is lost. Our smallest charges displaced a much greater quantity of rock than the same amount of powder by the old means, which we had opportunities of experiencing. With these advantages, this method of blasting places in our hands the most ample means of clearing harbours and rivers of rocks, &c. in any reasonable depth of water.

In using Dr. Hare's apparatus, it appeared that an important advantage was gained over that of Professor Daniell's, employed by Col. Pasley, inasmuch as a very troublesome arrangement, indispensable in the latter, was avoided. This consisted in not being obliged to insulate the conducting wires from the water, as in such a case the connexion of the conducting wires with the charge must be made before the cannisters are placed in the rock; every portion, then, of the wires where the connexion is made must be covered with the waterproof composition. By Professor Daniell's apparatus, it appeared that water was a conductor, thus destroying the electrical circle, if any part of the conducting wires came in contact with it.

Though Dr. Hare's battery was known to Col. Pasley, it was not adopted in his experiments, the reason assigned being that "it did not appear that he had ever used it under water."

I have the honour, Sir, to be,
Your obedient servant,
ALEXANDER PARIS, C. E.

Col. S. Thayer, Boston.
Navy-yard, Portsmouth, N. H., Nov. 9, 1840.

BRIGHTON BREAKWATER AND HARBOUR OF REFUGE.

We lately inserted a description of Captain Tayler's Floating Breakwater, as proposed to be applied at Brighton, (No. 952, for November, 1841). We have been since favoured with a copy of an Address by our esteemed correspondent, Mr. G. A. Wigney, to his

Townsmen," in which he lays
un the plan of a *solid* break-
a peculiar construction, which
ivented, and the adoption of
advocates with his usual ability,
g many advantages which no
reakwater can ever possess.
ney, referring to a Public
eld at Brighton to consider of
'ayler's plan, thus explains the
nces which led to the origina-
own.

quent to the meeting, and in the
of the same day, I was informed
n of the substance of what had
accompanied with the observa-
ow much better it would be to
l breakwater.' In reply to such
., I stated that, being without a
stone in the neighbourhood, the
n of a solid breakwater was out
stion, and that in those places
abundant supply could be com-
e enormous cost of construction
an insuperable barrier to its ac-
ent. But while conversing on the
occurred to me, that the formation
cast-iron plates, filled with con-
not only practicable, but that its
struction, and superior adaptation
pose, rendered it a subject well
ideration and inquiry; and having
ted the idea to the person with
s talking, I left with a determina-
sue the subject yet further."

* * *

gney then mentions other cir-
s connected with the matur-
plan, and thus proceeds to de-
ore in detail.
Structure, it will be composed of,
rely speaking,) indestructible ma-
cast-iron plates, coated with gas
ited by bolts, and rendered im-
water; capable of replacement,
n out, and filled with concrete in-
nually in durability, of such an
weight, as will render its stability
onceive, against the most violent
l to which an indubitable security
ed by piles and moorings, should
prevail as to its safety without.
vent the possibility of any accu-
f sand, gravel, or other obstruc-
to the entrance or elsewhere, the
sons allowing a clear run of ten
er beneath will obviate every such

Harbour of Refuge, it furnishes
s from the east, and another from
f requisite breadth, with twenty-
epth *of water at low tide*, and therefore admissible to vessels of the greatest burthen. The southern breakwater will furnish a light-house in the centre, 100 feet in height, or 55 in height above the highest spring tides. The eastern and western towers of such breakwater, and the southern towers of the eastern and western breakwaters, will furnish lights to direct vessels to each entrance.

"*As a Protective Harbour*, it will furnish, from the entrance to the interior, water gradually diminishing from the turbulence of the tempest to the stillness of a calm; and the addition of an inner breakwater may at any time be made, to increase the security of the shipping within, should such a measure ever be deemed necessary. At the highest spring tides, each tower will present a barrier to the waves fifteen feet in height above the level of the sea, and the intermediate caissons a rampart of ten feet.

"*As a Fortified Harbour, and an Armed Line of Defence for the Town in time of War*, I conceive that this structure is admirably adapted; as each tower, with the light-house, being mounted with one gun, will furnish a southern crescent battery of thirty-seven guns, and an eastern and western battery of eighteen guns each, which may be of sufficient reach to cover the whole town from east to west; affording not only a certain and instantaneous protection to the shipping within its precincts, and to the magnificent property which so splendidly adorns the sea-girt borders of your town, but also a safe and peaceful residence and resort, in time of war, to those residents and visitors whose support is indispensably necessary to your welfare and prosperity.

"*As a Panoramic Exhibition of Marine Scenery*, the imagination alone can furnish data for a description of the reality. Vessels of war, steam-packets, regatta yachts, ships of merchandise, boats for fishing, and skiffs for pleasure, will constitute the pleasing group that must delight the eye of every gazer.

"*As a Protective Girdle to the Chain Pier*, which beautiful structure is shown in its centre, the security which it will furnish will be effective and complete, and the embarkation from its platform at all times safe and pleasant.

"*As an additional and more extensive Promenade* than is now furnished by the Chain Pier, the iron ramparts on the eastern and the western side will present a continuous road-way, 12 feet in width, and nearly 3,000 feet in length; and at the end of each, a flight of steps will enable the pedestrian to pass, by boat or floating-bridge, the harbour's mouth; and ascending the southern breakwater, he may extend his walk a further distance of above 3,000 feet,

and making his return by the opposite course to that on which he commenced his tour, he will, on reaching the shore, have enjoyed all the exquisite pleasures attendant on the circuit of about 10,000 feet in distance.

"*As a Mercantile Harbour*, although we happily do not at present need one, and its appropriation for the purpose might be injurious to the welfare of the town, and prove inimical to the interests of the proprietors of Shoreham harbour and the Railway Company, which (for one) I consider we are in justice bound not to oppose, but on the contrary to support; yet should any fortuitous circumstances ever require its use for such a purpose, it will at all times be a source of pleasure to reflect that you have the means of availing yourself of its resources for the purpose, and having devised means for the transmission of the merchandise unshipped to one or more unobjectionable situations without interfering with the marine drive, the greatest objection to its use as a mercantile harbour may thereby be obviated; and I beg leave to take the liberty to suggest, that in justice to the Chain Pier Company, the use of the breakwaters as a promenade should be a subject of pecuniary arrangement with them, and which, I conceive, it would be to the interest of both parties to endeavour to effect.

"*As a Protective Harbour to Fishermen*, the cause of humanity, the welfare of a class so numerous and interesting, and the pecuniary interests of the rate-payers are powerful inducements to provide them a haven so beneficial in the hour of danger, so stimulative to habits of industry, from a consciousness on their parts of being able to pursue their calling in dangerous (yet for their purpose the most propitious) weather, having a port of refuge to fly to, from the eastern, western, and southern quarters, in every case of imminent peril.

"Having enumerated, I trust, a sufficient amount of advantages to stimulate you to the endeavour to obtain them, I hope I shall stand excused from entering into a detail of many others that reveal themselves in prospective, and for passing on to

"*The Estimate*, which, with the able assistance of several competent persons I have been able to arrive at the amount, as well as the insufficiency of data on a work of so novel and peculiar a character will admit; and having made an ample allowance for contingencies, I feel warranted in stating that, I think, the amount will be considerably under 200,000*l.*, one-third of which will be payable for manual labour, a circumstance very far from being unimportant to all those who are interested in the employment of the labouring classes.

"*The Testing of the Principle.*—The dictates of prudence naturally prompt the suggestion, that in case it should be deemed desirable by my fellow-townsmen that so important and great an undertaking should be accomplished, that in the first instance a sufficient number of eminent engineers and competent nautical judges should be consulted as to the probability of the realization of the anticipated advantages, and the practicability of carrying the work into effect; and to facilitate such inquiry, I beg to refer you to the perspective drawing and model which I have caused to be made, and which may be publicly seen at the Town Hall. Should their report be favourable, I beg to submit the suggestion that a subscription should be endeavoured to be raised for the purpose of providing and placing in their designed situations the lighthouse of the southern breakwater, the two adjoining towers, and the two intermediate caissons, as shown by the model, in the following spring and summer, and allow the succeeding winter to pass over in order to test the principle fairly, to ascertain if any improvement can be made in the principle or mode of construction, and to furnish the requisite experience which it may be desirable to obtain, preparatory to the execution of the work to the extent of completion.

"To ascertain the necessary amount to perform this experimental portion of the work, there are the same difficulties in the way as have occurred in making out the estimate for the whole; and as the execution of this minor portion will require nearly all those erections and subsidiary expenses as would be necessary to accomplish the whole, so therefore must the estimate for such portion much exceed the proportionate amount that would be incurred by its execution with the rest. But as such erections will serve their required purpose in ultimately completing the work, such an outlay will not be finally lost, provided it is deemed desirable to finish it. The amount requisite to carry into effect this experimental test, I have reason to believe will not exceed 7000*l.*; but I should suggest that 8000*l.*, in 5*l.* shares, be raised, and that such shares should become available, in case it should ultimately be deemed desirable to form a company for the completion of the work, of which the original shareholders would form the nucleus.

"*The Execution of the Work.*—That in the accomplishment of a work of such magnitude and novelty, many unforeseen difficulties may occur in addition to those which have been already anticipated and mentally provided for, there can be but little doubt; but let them be what they may, I feel assured that in the present day, abounding with so many stupendous and successfully executed projects, that sufficient engineering

can readily be procured to meet, re- and overcome any that may possibly sented. And while from the nature of gagements and avocations I must ne- ly decline any participation in its ac- ishment, should any such expectation ertained in consequence of my being ojector, yet I shall feel pleasure in unicating at my leisure opportunities se you may select (should you deter- o to do) to inquire into the merits of vention, the practicability of its execu- tion, and the advantageous prospects which its performance may offer, the several modes, means, and resources which I have devised for its commencement and completion; and should the result of my appeal to you cause the adoption of the plan, the endeavour to carry it into effect, and the appointment of a competent person to accomplish the work, I shall feel pleasure in rendering him assist- ance as my leisure may permit, and offering him such suggestions as it may be in my power to furnish, should they be required."

DAVIES'S ELLIPTOGRAPH.

(Registered pursuant to Act of Parliament.)

Fig. 2.

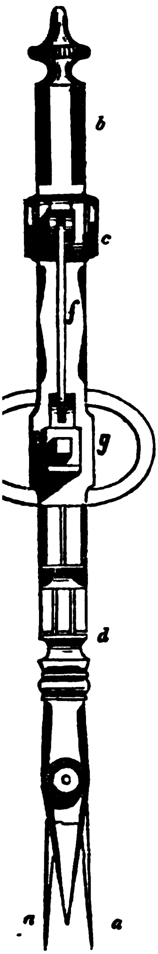
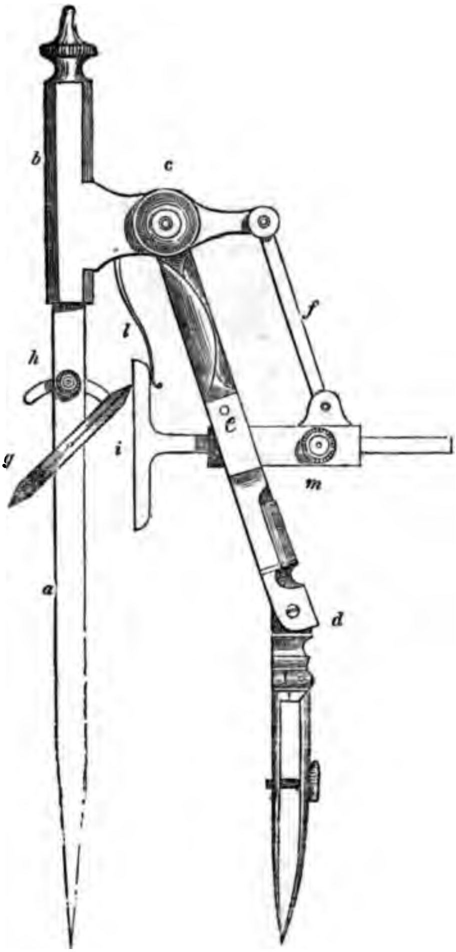


Fig. 1.



echanical draughtsmen have long ed the assistance of some simple instrument which should, without any previous complicated adjustment, enable

them at once to strike the ellipses, which would correctly represent the perspective of wheels and other circles.

Such an instrument has been designed by Mr. Henry Davies, already well known as the author of several other useful and highly important inventions, and we have much pleasure in adding to the list, that which is represented in the prefixed engraving.

This ingenious little instrument consists of an upright stem or axis, which terminates at its lower end in two points *a a*, to give it the required stability in a perfectly vertical position. On the upper part of this axis a compass head *b* revolves, having attached to it, by a joint at *c*, the pen or compass limb *c d*. A square horizontal shaft is jointed into the latter at *e*, and maintained in its position by the parallel rod *f*. Upon the central shaft or axis *a*, there is pivoted a circular steel plate with bevilled edges *g*, which may be set at any required angle to the horizon by the quadrant and set screw *h*. A T-shaped guide *i*, has its longer stem *k* passed through the horizontal shaft, and held by the set screw *m*; the face of the guide *i* is constantly kept in close contact with the edge of the circular disc *g*, by means of a small spring *l*.

A glance at this arrangement will almost suffice to show its operation; suppose, in the first place, that the disc *i* is set perfectly horizontal, and the instrument applied to describe a figure upon paper; on turning round the compass limb and pen *c d*, a transcript of the disc *g*, that is, a circle will be delineated, because the pen has been guided round it in a circular path by the spring *l*. Let the disc *g*, be now set at any angle, say 45°, and the instrument applied to paper and turned round; the pen will again be guided round the disc *g*, but no longer in a circular path; an ellipse will be described, which will be the correct perspective of a wheel or circle viewed at an angle of 45°; and so of circles viewed at any other angles, of a size within the powers of the instrument.

The set screw *m* allows the compass to be set to the size of the circle required; at the same time the guide *i* is always maintained in contact with the disc.

We hope and trust that this convenient and ingenious little instrument will be speedily brought before the public, in a form, and at a price, that will enable all parties to avail themselves of its important advantages.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees desirous of fuller abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for that purpose.*

GEORGE HENRY PHIPPS, OF DEPTFORD, ENGINEER, *for improvements in the construction of wheels for railway and other carriages.* Enrolment Office, January 1st, 1842.

The object of these improvements is to avoid the injurious effects of heating the tyre in the ordinary process of "shrinking on," by superseding that process. For that purpose the patentee proposes to construct a railway wheel in the following manner. A bar of wrought iron, is prepared of a proper form by rolling, in the usual manner, with an outer flange at one edge, and an inner flange in the centre of the bar; this bar is bent into a circular form and welded. A suitable number of wrought iron spokes (sixteen) are prepared, with an extended end or palm, which may be drawn out by hammering, or may be welded on; the inner end of each spoke is jagged, or perforated, in order that the cast metal may embrace and hold it fast. Eight of these spokes are then laid in a mould, and one portion of the boss or nave of iron, cast upon their inner ends; the other eight spokes have the corresponding portion of the boss or nave cast upon them. The two parts of the nave are then brought together, and secured by screw bolts, and the enlarged ends or palms of the spokes strongly secured to the alternate sides of the inner flange by screw bolts, or by riveting. Another method consists in placing all the spokes in their respective positions around the wheel, and casting the boss or nave in one piece; the palms of the spokes being afterwards riveted to the inner flange. In the wheels thus constructed, the position and appearance of the spokes strongly resemble the suspension wheels of Messrs. Jones and Co.; but the patentee also proposes to construct wheels on the foregoing principle with a single row of spokes lying in the same plane. Wheels for common road carriages may also be similarly constructed, by omitting the outer flange, which is essential to the wheels of railway carriages.

claim is, to the construction of a ith a cast iron boss or nave, with t iron arms or spokes cast in it: the spokes being attached to the wrought e by riveting or bolting.

IGE ONIONS, OF HIGH-STREET, DITCH, ENGINEER, *for improved and rails for railroad purposes.* ent Office, January 7, 1842.

invention of improved wheels for purposes consists in casting such of iron made from Cumberland or ire ores, which is afterwards made le by annealing, and subsequently dened. The improvements in rails oad purposes consist of an arched anufactured of common cast-irod, groove running along the centre and into which groove a rail, made cast from Cumberland or Lancashire d afterwards annealed, is affixed. ase is to be made either singly or –if doubly, by connecting surfaces

laim is, 1. To the casting of wheels, way purposes, of iron made from land or Lancashire ore, afterwards nalleable by annealing, and cased; 2. As well the mode of construces, as casting the rail of iron made umberland or Lancashire ore, and alleable by annealing.

IAS YOUNG, OF QUEEN-STREET, , MERCHANT, *for improvements in* Enrolment Office, January 8, 1842.

irst of these improvements, which are number, relates to hand lamps with gand burners, and consists in the apa of fine wire gauge or perforated metal hrough which the air is admitted, so revent the flame being affected by a air while in rapid motion. The improvement consists in the applicatubes to an argand lamp, by means h a supply of air is carried down ove to supply the passage through und the burner. The third improvensists in a mode of attaching carriage so that they draw their supply of air thin the carriage, thereby ventilating e; at the same time preserving their licular position without being in any cted by the inclination or motion of riage. The fourth improvement reship's lamps, the stem of which is ed of a number of sliding telescope o as to admit the lamp to be set at quired and admissible height, while er tube, or socket, fits into a cylindrical the centre of a weight of a hemial form, which is supported flush with face of the table, &c. upon gimbals. th improvement consists in a mode ying a metal *plate or deflecting* surface within the glass chimney, having a large hole in its centre, and a number of smaller holes around its inner edge for regulating the supply of air around the flame. The sixth improvement consists in the introduction of air intermediately of the length of the chimney, by means of perforations in the glass chimney, or by making the glass chimney in two or more parts, and introducing the air at the joints. The seventh improvement consists in making the glass chimneys of lamps in two parts, and applying a deflecting plate between them, or by forming the plate on one of the parts of such chimneys. The eighth improvement consists in a provision for raising or lowering the glass chimney, so as to adjust it to the most advantageous height for obtaining the best kind of flame; this is effected in one case, by making the gallery in two parts, one of which screws up or down within the other.

The claim is—1. To the mode of making hand lamps; also the mode of applying woven wire surfaces to argand lamps.

2. To the mode of conducting air from above into the interior of an argand burner.

3. To the mode of supplying carriage lamps with air from within the carriage, and so arranging the parts as to retain the lamp in a vertical position.

4. To the mode of retaining the lamp in a vertical position at sea, by applying the apparatus above described to a table or other fixed surface.

5. To the mode of applying a plate or surface within the glass chimney of lamps by suspending the plate from above.

6. To the introduction of air intermediate of the length of the chimney, by applying perforated chimneys—or chimneys made of two or more parts.

7. To the making of chimneys of two parts, and applying a plate between them, or forming the plate on one of the parts of the chimney.

8. To the mode described of regulating the height of the chimney and plate.

CHARLES PAYNE, OF SOUTH LAMBETH, CHEMIST, *for improvements in preserving vegetable matters where metallic and earthy solutions are employed.* Enrolment Office, January 8, 1842.

These improvements consist in impregnating the vegetable matters to be preserved with any suitable metallic or earthy solution, and afterwards decomposing the same, thereby precipitating the insoluble substance so formed, in the substance of the preserved matter. Thus, for instance, a piece of wood which is to be preserved by this process, is placed in a suitable vessel and a vacuum produced therein by an air pump, or by any other convenient means. A strong solution of sulphate of iron is then admitted, which enters

into the interstices of the wood; when saturated, the wood is either, in its wet state, or after being dried, treated with a carbonated alkali, (carbonate of soda being preferred) by which the salt of iron is decomposed, and becomes converted into an insoluble precipitate within the substance of the wood. The saturation of the wood may be assisted by pressure or not, as found to be best.

Another process consists in the employment, in like manner, of a solution of alum, the decomposition of which is also to be effected by the same agent as before—carbonate of soda. The patentee observes, that the processes of injection, by vacuum and compression, as well as the employment of metallic and earthy solutions, have before been applied to effect the object in view, the mere use of which he disclaims; but what he claims is, the mode of preserving woods and other vegetable substances, by causing them to be impregnated with a solution of metallic or earthy matters, and then by chemical decomposition to retain the matters employed, in an insoluble state, in the substance of the vegetable matter, when such effects are obtained by the combined processes of exhaustion, compression, and decomposition, as above described.

MOSES POOLE, OF LINCOLN'S INN, GENTLEMAN, *for improvements in steam baths and other baths.* (A communication,) Enrolment Office, January 13th, 1842.

A room is constructed in a steam-tight manner, by being lined with sheets of lead or zinc; on one side, near the floor, there is an opening, furnished with shutters, by which the admission of atmospheric air can be regulated at pleasure, while on the opposite side of the room, near the top, another opening, similarly fitted, is placed for the escape of the impure heated air and steam. Light is admitted at the top by a double sky-light. A boiler (of copper is preferred) is furnished with a safety-valve, and also an apparatus for supplying it with filtered soft water. Steam is generated in this boiler under a pressure of from 10 to 20 lbs. upon the inch, for the purpose of supplying steam to the bath, and also for heating a quantity of water contained in an elevated cistern. Another elevated cistern contains a supply of cold water. Within the room or bath there are three rose heads, one above the other, connected with the hot and cold water cisterns in such a manner, that by regulating the cocks, a shower of hot or cold water, or of any intermediate temperature, may be obtained from either of these rose heads; so that a person may apply a shower of cold water to the head, warm to the stomach, and hot to the feet. The mode of using this improved bath is as follows:—The bather, on entering the bath, prepares himself by first subjecting his body to the shower from one or more of the rose heads gradually increasing the temperature; steam is then gradually admitted, until the bath attains a temperature of 80° or 100°. The floor is of wood, perforated with a number of holes for the escape of the water from the rose heads, and provision is made for the bather to sit or lie down; flexible tubes are also attached to the steam pipes, by means of which jets of steam may be directed to any part of the body. The steam bath having been continued long enough, the hot shower bath is again resorted to, gradually decreasing the temperature till it approximates to that of the external atmosphere.

The claim is, 1. To the mode of producing a steam bath by the application of steam (generated under considerable pressure) within a room so arranged as to allow of a sufficient circulation of fresh atmospheric air, as above explained; 2. To the mode of combining the use of a high-pressure steam bath in a ventilated room, with a rain douche, or water bath, whereby the skin is prepared before and after a steam bath, as above explained; 3. The mode of regulating the temperature of douche baths, "whether rain or voluminous."

RECENT AMERICAN PATENTS.

[Selected and abridged from the *Franklin Journal.*]

IMPROVEMENT IN SMELTING FURNACES. *W. H. Phillips.* The patentee introduces the specification of this improvement with the following general remarks. "For the purpose of economizing fuel, it is a point of considerable importance to be able to use the waste heat for supplying the blast to the smelting-furnace, and this has been done in numerous instances, and under various modifications of the apparatus employed. It has been found, however, that in all cases the air so heated is subjected to great variation in its temperature, and that from causes incident to the employment of such furnaces, when dependence is had upon the waste heat alone to accomplish the intended purpose. Whatever produces a diminution of heat in the interior of the furnace must produce a corresponding effect in the air-heating apparatus, and that at a time when it is most desirable to keep up, or increase, the temperature of the hot blast, in order the more rapidly to restore the wanted temperature in the furnace. One of the most general causes of the temporary diminution of heat in the furnace is the introduction of the charges of coal, and flux. The quantity of gas emitted from the fuel also varies considerably, in different stages of its combustion, and with

course, the quantity of flame in the g apparatus; other sources of such ion of heat are well known to those rsant with the use of smelting-fur-" This difficulty it is the object of iprovement now patented to obviate. iethod adopted by the patentee is as s. "On the sides of, or otherwise to, the heating apparatus on the tunnel I place one, two, or more small fur- for the express purpose of heating a n of air, which is to pass from them ie heating oven, and to co-mingle with irising through the chimney of the ng-furnace. To these auxiliary fur- I make close-fitting doors, in order o air shall pass into them, excepting which is forced to pass through the ig fuel which they are to contain. Into h-pit of these auxiliary furnaces I in- e a pipe, through which air, either hot d, may be blown from any suitable part blowing apparatus, which, by passing gh the ignited fuel, and thence directly e heating-oven, may be made to com- ate a very high degree of heat to the contained therein; I, of course, regu- ie supply of air to be blown into the g-oven, and to pass from the blowing itus into the auxiliary furnaces, by of cocks, valves, or dampers, applied ordinary way, which devices are well i to all machinists." The patentee that when it is not requisite to employ at from the auxiliary furnace, or fur- by closing the valves in the passages g into and from them, the contained ill merely remain ignited, scarcely un- ng any combustion, until urged by the

:AM ENGINE PISTONS, *C. F. Pike.* ature of this invention consists in the f cylindrical metallic wedges, within f metallic rings when used for the ig of pistons, and without side of ic rings when used for the packing of rods, or valve stems. "To enable ," says the patentee, "skilled in the make and use my invention, I will d to describe its construction and op- a. I construct my packing for steam- s, or other pistons, by making two of cast iron, or other metal, turned as as the diameter of the cylinder, and so that the rings will just fill the space en the head and follower of the piston ground together. I saw said rings so that they may expand to fill the er. I make a cylindrical wedge as wide two rings afore-mentioned, the exter- ameter of which will just admit it to *within the afore-mentioned two rings they are placed in the cylinder.* The internal diameter of said wedges being conical, and as much larger at one end than at the other, as may be deemed necessary, said wedges being cut longitudinally into four or more parts, so that each part may be forced out from the centre against the two rings afore-mentioned. I make another cylindrical wedge in the form of the frustrum of a cone, and about seven-tenths as long as the one last named, the external diameter and taper of which corresponds with, and fits into the internal diameter of the large end of the other, the thickness of which I make sufficient to admit of screws being tapped into it, to move it longitudinally on the barrel of the piston. To keep said wedge in its place, I put in four, or more, screws,with collars on them, to be let into the followers, two on one side, and two on the other. Two with the collars on the inside shove the wedge ahead, and the other two hold it, or draw it back. I construct my packing for piston rods, &c., by making two rings of brass, or other metal, of a diameter that will just admit them on the rod, and so wide as just to fill the space between the bottom, or the bushing, and the cap, when ground together, and of a thickness of about one-eighth of the diameter of the piston rod, which I cut open, and place on the rod, so as to break joints. I make a cylindrical wedge of a width and internal diameter, corresponding with the width and external diameter of the two rings afore-mentioned. I make said wedge thicker at one end than at the other, to give it the proper taper, and cut it longitudinally, into four, or more parts, so that each part may be forced in towards the centre against the two rings afore-mentioned. I make another cylindrical wedge about seven-tenths as wide as the last named, the internal diameter and taper of which corresponds with, and fits on the external diameter of the small end of the other. The thick end I make of a proper thickness to admit of four set screws, made in the same manner as described for the piston, the external diameter of which is the same as the internal diameter of the head, or stuffing box; I fit on a cap with set screws therein, to adjust the last named wedge, so as to keep the two rings snug to the rod."

IMPROVEMENTS IN THE MACHINERY FOR MAKING RIVETS; *Oliver Edes and Andrew Holmes.* The claim refers throughout to the drawings, and could not be understood without them; we will therefore merely attempt to give a general idea of the improvements claimed.

The first improvement consists in the construction of the cutting apparatus, the dies of which are semi-circular, so that in the operation of cutting the wire shall not be

flattened, there being a standard, or gauge, against which the wire is forced by the operator, to regulate the length of the rivet. The second is in the combination of the moving cutter, which separates the blank from the rod, with a spring arm for "pinching, or nipping, the piece of wire separated by the cutters, and conveying it downwards to the aperture" of the leading apparatus; and also in the arrangement of parts which withdraw the arm above mentioned from the blank after it has been carried to the heading apparatus. The third is in the combination of levers, &c., for forcing, or pushing, out the rivet from the aperture, after the heading machinery has performed its office.

Moveable Loading Muzzle for Rifles; *Alvan Clark*. The object of this improvement is, to facilitate the loading of the rifle, and to preserve the calibre of precisely the same diameter to the very point of delivery of the ball, and this is to be effected by means of what the inventor calls a "moveable loading muzzle," which is put on to the end of the barrel for loading, and removed when the rifle is to be fired. The bore of this loading muzzle, where it meets the barrel, is of the same diameter with it, and is enlarged towards the mouth, so as to receive the ball with ease, and gradually prepare it to be received by the barrel. The rifling of the barrel and muzzle should correspond. The muzzle may be fitted on by means of pins projecting from it, and fitting into holes made for that purpose in the end of the barrel. The claim is confined to this device.

Improvement in Steam Boilers; *John Penniman*. We will merely quote the claim appended to the specification, as it gives a sufficiently clear idea of the improvement to bring it within the comprehension of any one, viz.:—"Having thus fully described the nature of my improvement, and the manner in which I carry the same into operation, what I claim therein as my invention, and desire to secure by letters patent, is, the placing a series of circulating tubes on the front plate of the boiler, in such a manner as that they shall, at their lower ends, communicate with the water in the lower part of the boiler, and at their upper ends with the water in said boiler a little below the water line, whilst they are, along their whole length, exposed to the direct action of the heat in the fire-box, in the manner, and for the purpose, above set forth."

In pointing out the effect produced by thus placing the tubes, the patentee says, "as these tubes open below into the lower part of the boiler, and at their upper ends into the upper part of it, below the water-line, the water, which will become highly heated in the lower parts of the tubes, will naturally ascend, and that with considerable rapidity, towards the upper part, where they will give out their steam, and, by the action of the water circulating through them, they will necessarily draw the water in the lower part of the boiler towards them, and effect the required circulation."

Improved Power Loom; *Erastus B. Bigelow*.* The patentee describes his improvement as follows:—

"My improvements consist principally in the manner in which the shuttles are thrown; the manner of raising and depressing the shuttle boxes, and the manner in which the picker is relieved from the shuttle.

"In throwing the shuttles I cause the two picker staves to operate simultaneously, so that the shuttle may be thrown from whichever of the boxes is presented to their action. This is effected by the use of one picker treadle only, which is acted upon by a cam ball, in the usual way of working such treadles. From this treadle two bands are extended, and pass around the two picker pulleys, in such a manner that when the treadle is depressed, both the picker staves will be set in action at the same moment. By this arrangement two or more shuttles may be successively thrown from the same end of the loom by the action of one treddle.

"The shuttle boxes are raised and lowered in the following manner. A shaft extends along under the race beam, from one shuttle box to the other, and carries pinions which take into racks attached to the shuttle boxes; it will be manifest, therefore, that by causing this shaft to revolve, the shuttle boxes may be raised. The revolving of this shaft is effected by the action of a spiral or other spring, one end of which is attached to the frame of the loom at its back, and said spring extends forwards towards the lathe; from this forward end a band, attached to it, passes around guide pulleys, and also around a pulley upon the above named shaft, to which latter the said band is attached. The action of the spring, by its drawing upon the band, will cause the pinion shaft to revolve, and will consequently raise the shuttle boxes. Should this spring be thrown out of action, and the band by which the shuttle boxes are raised be relaxed, they will then descend by their own gravity. To take off the tension of the spring there is a cam upon the main shaft of the loom, which cam, as the shaft revolves, depresses a treadle, to the end of which a band is attached which operates in such a way as to relieve the shuttle boxes from the action of the spring, and they then descend.

* Abstract of English Patent, given at page 29 of our 35th volume.

ieving the picker from the point of :, I make use of the protection rod ig a part of the apparatus em- the ordinary power loom for stop- loom when the shuttle does not ne in the shuttle box. From the rod, which extends along below e boxes, I allow a small arm, or descend, which finger, as the lathe towards the breast beam, strikes stop, or pin, attached for that pur- e frame of the loom, causing the rod to rock or revolve to a short This gives motion to two arms, end out from the extreme ends of ction rod, opposite to the outer ch of the shuttle boxes; from these ion is communicated to a lever, rks on a fulcrum over the outer ch of the shuttle-boxes, said arms nnected to the levers by rods, or depressing the outer ends of these eir inner ends are raised, and to s are appended rods which carry wood or metal, which when down d embrace the picker rod, and in ion they serve to hold the picker at stance from the end of the shuttle- to stop the shuttle; the picker is oved from the point of the shuttle ising of the lever, the picker being pass home to the end of the box, ng the shuttle and shuttle-box free ed or lowered without obstruction, r being also ready again to act on a The picker is removed from the he shuttle, after the block has been a rod, actuated by a spring, which nnected with the picker stave by a order that the stave may, by its nove the rod, also that it may not e motion of the picker.

:OCK FOR WATER AND GAS PIPES; *obertson.* This stop-cock has a lve, resembling others which have l, and it is so constructed as to ad- he easy sliding of the valve, and, at time, of its being pressed against fter it is in its place; and also to the cleansing of the chamber from that may accumulate within it.

ox is constructed as usual, with two s, which fit into the pipe, and a top which works the screw, which moves up and down. The valve has three ns, one at top, with a vertical slot, plays a projection from the nut on the screw, and one ear at each he valve is pressed to its seat by patentee calls a "wedge," which is at top to the nut, and works up *with it—it branches off, and each ts upon two projections* on the *he valve, one towards each edge.* Each branch, at the edge, is provided with a projection, which slides against the side of the box opposite to the valve seat. When the screw is turned with the view of shutting the valve, the two branches of the wedge are resting on the top of the projections on the back of the valve plate, and thus as the wedge descends it carries the valve with it, without pressing it against its seat; but when the valve has reached the bottom, the two projections on the back of the branches of the wedge have reached two notches in the side plate of the box, which permit the branches of the wedge to slide over the projections on the back of the valve, and thus wedge it to its seat—the slot in the piece which projects from the upper part of the valve allowing the wedge to descend after the valve has reached the bottom. The bottom of the chamber is provided with a seat for a conical valve, which works up and down by means of a lever passing through the casing for that purpose—when the valve is lifted up, the dirt passes out.

NOTES AND NOTICES.

Ornamental Engraving.—The new Austrian bank notes, which made their appearance with the new year, are exceedingly beautiful, indeed far too beautiful for bills of credit. They resemble the steel-plate engravings in the English Annuals. They increase in beauty and elegance in proportion to the magnitude of the sums they represent. These new notes have created quite a sensation in our capital; and for several days after they were issued, the national bank was besieged by persons anxious to obtain them. They are for 5 florins, 10 florins, 20 florins, 50 florins, 100 florins, and 1,000 florins. The principal artists in Vienna have been employed in preparing the designs and executing the engravings. The paper employed for these bank notes is of a most superior kind, and manufactured for the purpose. Of its strength an idea may be formed from the fact that a strip of it half a yard long will bear the suspension at its extremity of 35 pounds weight—*Vienna Paper.*

Effects of Frost on Railways.—Such was the slippery state of the rails upon the Eastern Counties line on Thursday last, that the evening train was with difficulty conveyed from Romford to the Brentwood terminus at a very reduced rate of travelling, with the aid of three engines. The same difficulty has presented itself, more or less, upon all the lines, the engines being at times only made to progress at starting by the application of manual labour.

Government Fire Engines.—The defective state of the fire-extinguishing *materiel* in the Tower, at the late conflagration, has at last attracted the notice of the government authorities. The LordsCommissioners of the Admiralty have issued instructions that all the fire-engines in the Woolwich Dockyard should be worked with water by the police force every ten days, to ascertain that all the apparatus continues in proper order, and to ensure their efficiency in case of their services being required. One of the inspectors of police is to be present at such trial, and to be responsible for the engines being in good working order. An examination of the fire-engines, &c., in all the dockyards is being made, with a view to their being put into an efficient state.

Clay Buttons.—At the Annual Meeting of the Liverpool Polytechnic Society, held last week, it was stated that 5,000 gross of buttons are now made weekly at Messrs. Minston and Boyle's, Stoke-upon-Trent, according to Mr. Prosser's dry powder process, described in our 23rd Vol. p. 592. The demand for them becomes greater than can be supplied by the present number of presses.

Supposed Spontaneous Combustion on board Her Majesty's Steamer Avon.—The Avon had been to Cork and Liverpool to embark volunteers for the navy, and had left the latter port for Plymouth. While in the St. George's Channel, about 20 miles off the Bishop's Light, and 30 from land, about half-past 4 in the morning, the stokers at the furnaces complained of an unusual quantity of smoke, when it was observed that it came from the door of the larboard coal-bunker. The scuttle over this bunker was opened, and some water poured down on the coals, but the water not reaching the flames, it aided rather than retarded their progress. The scuttle over the after coal-box, five feet from the end of the boiler, was then opened, and the flames bursting forth, displayed the head quarters of the enemy. The scuttle was immediately replaced to prevent a current of air from assisting the flames, and the deck opened further forward, where the coals were moved and lifted, that the water might penetrate to the centre. This had the desired effect, for after throwing down a large quantity of water, the fire was got under. By the most arduous and incessant exertions for six hours and a half, the ship was saved, and got into Milford, where she had pieces of elm plank fastened to her outside, and a portion of her deck renewed, before she ventured again to sea. On an official investigation of the Avon, it is found that on her larboard side the ends of four beams are so burnt as to require new; the shelve-piece and water-way are partly destroyed; the internal plank is entirely consumed, and the outer burnt nearly through. Nothing could have saved the vessel had she burnt through at this place, it being 18 inches below the water line. The deck is burnt fore and aft, from 12 to 14 feet, and in a transverse direction from the side nearly 6 feet. It is supposed the fire commenced about 6 or 7 feet below the deck, on the upper part of the coal boxes, and must have done serious damage before it was discovered, exposing the persons on board to the most imminent danger.—*Newspaper.* [We see no evidence in all this of the alleged spontaneous combustion. Ed. M. M.]

Coal in Borneo.—A recent expedition to Borneo has ascertained that this island is likely to prove of vast importance to the commerce of the Indian seas, large beds of coal having been discovered in it. Many of the specimens prove to be of superior quality. The coal mines of Borneo are stated to be easy of access, and they extend along the coast of Pulo Cheremin, an island at the mouth of the Borneo river running out towards the sea, and also extending inland, but how far, or to what depth, has not yet been discovered, though both are evidently considerable. In Pulo Kain Arrang, another island about half a mile distant, coal had been found on the surface, the quality of which, however, was not equal to that of the former, although there was every reason to believe that veins of a superior description existed there. The main land of Borneo itself afforded excellent samples, which the natives described as existing in large quantities: and some of them, whose intelligence and veracity could be relied on, stated that there were "mountains of coal, and that hundreds of ships might be laden with it."

Proposed Junction of the Pacific and Atlantic Oceans.—In Mr. Stephens's "Travels in Central America," he advocates the bold design of joining the Atlantic with the Pacific Ocean by means of a canal between the Gulf Nicoya and the harbour of San Juan, a distance of only about sixteen miles. From the lake of Nicaragua to the harbour of San Juan on the Pacific, the distance is less than sixteen miles; and this slender line of earth is the only important obstacle which impedes what would, undoubtedly, be the greatest, the most important alteration, ever effected by man in the physical arrangement of the globe. The proud mountains of Central America here bend themselves down—as if to permit and sanction the enterprise—to the trivial elevation of 600 feet; and through this hill it is contemplated to cut a tunnel of one mile in length, at the height of almost 72 feet above the water of the lake, and 200 feet above the low-water level of the Pacific; the distance from the lake to the tunnel being about 10 miles, and from the tunnel to the Pacific about 4 miles; whilst the difference of level could easily be overcome by lockage. The only engineering difficulty in the execution of the work would be the tunnel; and we must confess that the idea of an excavation, lofty enough to permit ships of 600 tons to pass through, with their lower masts standing, is, to us, even in these days, when engineers take all manner of liberties with mountains and valleys, somewhat startling; but Mr. Stephens speaks of it with perfect coolness.—*Quarterly Review.*

Rules for Walking in Frosty Weather.—1. Take short, quick steps at all times, and in all situations. 2. If descending any inclined road, take care to put down the toe first. 3. If ascending, plant the heel firmly. 4. In all cases, keep the body in rather a stooping position, with the knee joints playing loosely. If you attempt the *stately*, ten to one but you measure your length upon the ground. Better to toddle awkwardly home, than be carried on a shutter, with a leg or arm broken.—R. A. B.

New Locomotive.—A mechanician named Macdinger, residing at Newbourg, on the Danube, has constructed a carriage on three wheels, which, by the effect of some internal mechanism, was impelled at the rate of four leagues an hour. A child may set the machine in motion, and the inventor is at present constructing a machine on a larger scale, which he expects will render the construction of railroads no longer necessary.—*Augsburgh Gazette.*

Postage Envelopes.—A correspondent requests us to call the attention of persons who, in writing letters of business, use envelopes, to the importance of their writing the address upon the sheet enclosed. The address being written upon the envelope only, the document cannot be made available in matters of legal proof, which is frequently the object of both the sender and the receiver.—*Times.*

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Mechanics' Magazine,

EUM, REGISTER, JOURNAL, AND GAZETTE.

4.] SATURDAY, JANUARY 29, 1842. [Price 3*d.*

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

EMSLIE'S CHIMNEY SWEEPING APPARATUS.

Fig. 1.

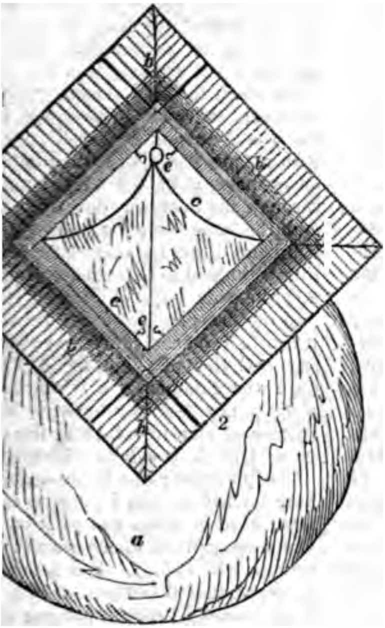


Fig. 2.

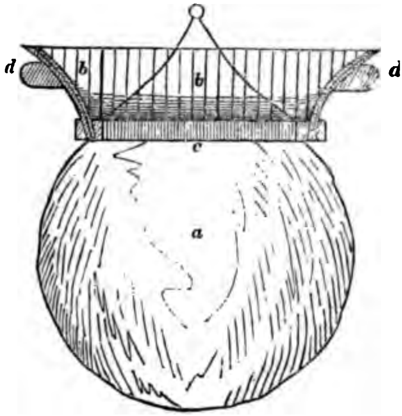


Fig. 3.

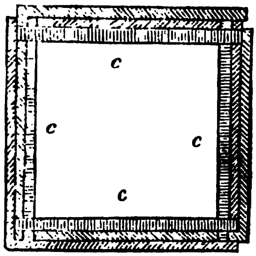


Fig. 4.

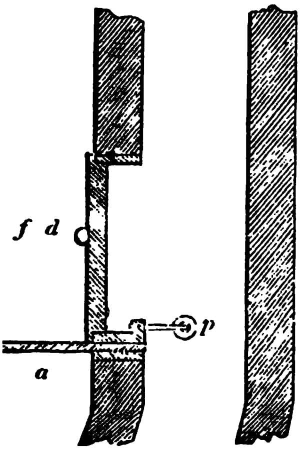
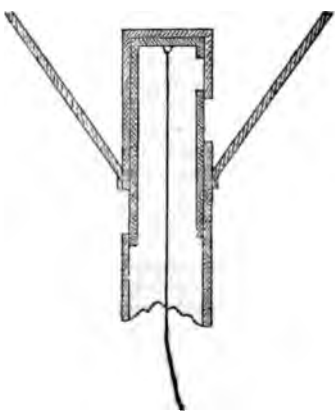


Fig. 7.



MECHANICAL CHIMNEY-SWEEPING.

Newcastle-on-Tyne, January 12, 1842.

Sir,—Parliament having enacted that the use of children in the cleansing of chimneys shall terminate in June next, I beg therefore to submit you, for the perusal and consideration of your numerous readers, some plans and suggestions which have occurred to me recently, for effecting by machinery that necessary object—a clean chimney.

In many places in Scotland, and probably in England likewise, it has been usual to cleanse chimneys from the summits of the flues, by working up and down therein, by means of a rope, a whalebone or cane brush, weighted sufficiently to carry it over any impediments it may meet with in its descent. That this mode is effectual is well known; but as it is attended with very great danger to the persons employed, and as considerable damage to the roofs, chimney-pots, &c., frequently results therefrom, it has not been of such general adoption as I feel assured it would have been, had these objections to its use been removed. It has been said, that the insides of the flues receive considerable damage from the action of the weights attached to the brush; I allow this—but at the same time think that the difference between this mode and others in use for the same purpose is but trifling. Glass's machine, and that most inhuman of appliances, a human being, are continually bringing down with them pieces of the pargetting, in too great quantities, often, to escape our most casual observation. As the rope and weight-brush mode is capable of cleansing any flue, however intricate may be its construction, if it has descent sufficient in its angles, (that is, if the angles of the flues be any thing more than right angles,) and if the first-named difficulties to its use can be overcome, I think it will be judged one of the most useful of means — embracing efficacy, simplicity, and economy, in a very great degree. The impediments to its use I hope to set aside in the following manner:—

At the highest accessible part of the chimney breasts, (which, in most cases, will be just under the roof of the building, or outside the roof, if it be flat and easily got at,) let tin frames with doors, one door for each flue, be constructed, so as to shut perfectly tight, and to open outwards, to be fixed solidly into the brick or stone work of the chimney, as the case may be; and on the bottom part of the frames, inside of the doors, have pulleys, sufficiently long to project over into the centre of the flue, and to shut up, when not in use, in a line with the doors when they are closed. After having swept that part of the flue between the iron doors and the top of the chimney with a long flexible handled brush made on purpose, place the weight and brush through the door-way down into the flue, and the rope over the pulley, and work it up and down in short lengths, till the flue is judged to be sufficiently cleansed. All the soot will, of course, fall down into the fire-place, as usual, from whence it can be removed. In the accompanying sectional view of a flue, fig. 4, *f d* represents the flue-door; *a* the damper, and *p* the pulley. A more simple, safe, and efficacious plan for effecting the object in view, I think, it will be difficult to find.

As in all the plans for sweeping I shall here lay before you, I purpose using the same kind of doors and pulleys, the previous description of my plans in respect thereto will suffice. I beg to add here, however, that in connection with the iron door-frames I propose placing dampers, so that on any flue taking fire, it may be extinguished by the mere closing of the same, and before any danger to the building, or to the surrounding buildings, could accrue.

If the small emission of smoke which would generally take place from the edges of the dampers were obnoxious—as it would be if placed in a sleeping apartment, such as the garret frequently is—this might be avoided by making the damper to work in close cases, with air-tight glands.

The offensive smell of soot, and other discomforting circumstances peculiar to "chimney-sweeping days," induce, no doubt, frequent delays in cleansing, which are the cause of many destructive conflagrations. I therefore suggest the following remedy.

As before stated, let the flue-sweeping doors and pulleys be fixed; then have a machine constructed on the plans re-

ited in figs. 1 and 2, the former ich shows the machine in a closed and the latter a section of it through ie 1 2 of fig. 1. *a* is a leathern bag tching the soot scraped off the sides : flues by the scrapers *b b*. These ers are to be formed of thin steel ; hoop, of, say, 1 inch width, turned over slightly at the top, and fitted at the bottom on to four iron plates, each turned in the centre to a right angle, and made to closely run over each other, as depicted in fig. 3. The steel scrapers, which will join at the edges, are to be fixed on the outside of the inmost plate and on the inside of the outmost, so that

Fig. 5.

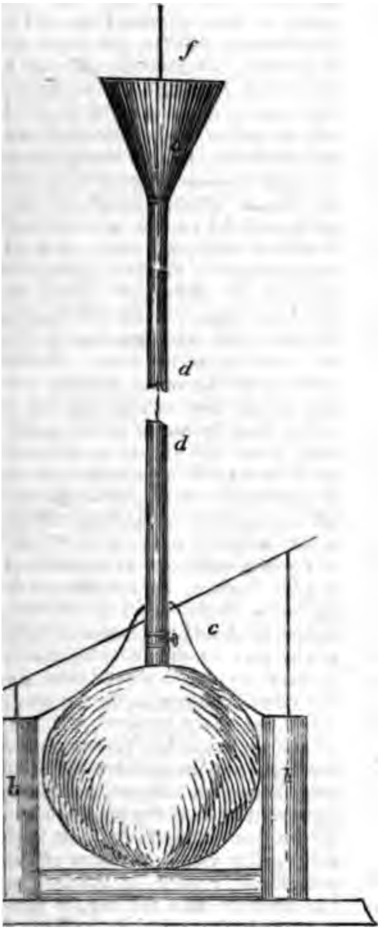
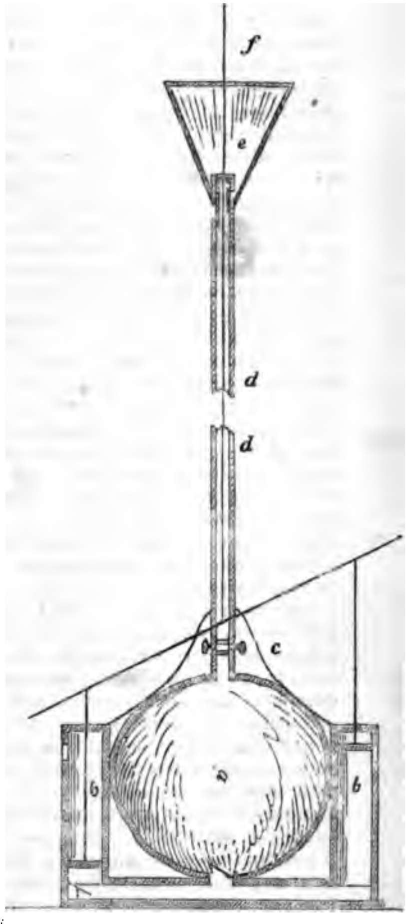


Fig. 6.



may run closely over each other. in the scraper plates sufficiently g springs, *c c c c*, are to be fixed, at the scrapers may be forced and out to every side of the flue. Under urn-down edges of the scrapers I se *fitting leather cushions, d d,* to *st any soot getting down into the ey, when the scrapers* may be pressed down on coming into contact with any rough surface in the flue. The edges of the scrapers are turned down, in order to facilitate their getting over any projection that may occur in the passage up the flue of the machine. To have particular cleanliness, there should be a chain down each flue, to be hooked up out of sight of the fire-place when not

in use, so that the before described machine might be at once attached and drawn up, instead of letting a chain down the chimney each time, which would of course carry with it some portions of soot. A small windlass, capable of being moved to each of the flue-doors, would be requisite, in order to get the machine up the chimney, with the soot it might collect. The way to sweep a flue with this machine should be this:—Attach the machine at the bottom of the flue to the hook on the chain, then wind it up the chimney till it arrive at the door, then sweep the upper part of the flue as before described; the machine being allowed to remain at the place to which it was drawn till this be accomplished, and which would, of course, catch the soot falling from the action of the broom. Any soot which may hang around the scrapers should be swept into the leather bag; and then, having stopped the action of the springs in the inside of the machine by means of the screws *e e e e*, (fig. 3,) withdraw it out of the door-way, remove the soot, take it down to the next fire-place, the flue of which is to be swept, and proceed as before. At the enlarged part of the flue, round the fire-place, a small hand-brush should be used to remove the soot. A machine of the nature here described might be kept in every house of good size, and worked by the servants, who, for their own sakes, would be as cleanly as possible in its use.

The next and last method I have to propose, is perhaps more for the sake of exhibiting a very novel mode which has occurred to me of effecting the object in question, than as a means likely to be of good use or general adoption: but if not of use itself, it may in the minds of others suggest some plan of greater utility than any yet described. *a a*, Figs. 5 and 6, is a metal vessel capable of sustaining a considerable pressure of air, forced into it by the pumps *b b b b*; *c c*, is a stop cock or valve for shutting off from, or regulating the pressure of air in the leathern hose *d d*. This hose must be made perfectly air tight, and sufficiently strong to resist a considerable pressure from within; *e c* is a leathern bag, at the throat of which a valve is placed, as shown enlarged in fig. 7, and from which to the air-vessel *a*, is a strong string of any tough material for regulating its action. Round the leathern bag are placed steel springs to cause it to collapse when the air is emitted therefrom; at the top of the bag is placed a flexible feeler *f*, made of whalebone, or any such material, with a round knob of any hard substance at top. To use this machine, first condense air into the vessel *a*; when deemed sufficiently powerful, having the hose ready to project up the chimney, turn the tap *c*, which will allow the compressed air to flow up the hose and give it considerable stiffness, yet retaining great flexibility; on the air passing up the hose it will (the string being slack) force the valve to the top of its seat, where it will remain so long as the pressure in the hose shall last, and the string be untouched; thereby preventing any air getting into the bag *b*, which, therefore, in consequence of the outside springs, will be in a closely collapsed state, and offer no impediment to the free passage of the hose up the chimney. When the hose has been forced sufficiently high up the chimney, the string communicating with the valve is to be drawn till the side aperture of the valve, and the one leading into the bag correspond, where it is to be kept by means of any small apparatus fixed in the air vessel. On the condensed air being admitted to the bag, it (the bag) will of course distend, and fill the aperture of the flue. When it is to be drawn down, the soot, (if the edges of the bag, which are to be made of tough flexible leather, have sufficient hold of the sides of the flue,) of course coming before it, should the bag stick in the flue at any part, or should it be necessary to go over any place a second time, or more, the valve string is to be further pulled down and there retained, till the whole of the air in the bag becomes excluded; the bag, from the pressure of the springs, will then again collapse, and permit the upward motion of the hose to any height in the flue required; by then letting the valve go, it will, by pressure of the compressed air, resume its position opposite the aperture into the bag, if the string communicating with it, be set, for its assuming that station; otherwise, it will go to the top of the valve seat, and preclude the emission of air in any direction, when the bag will again become filled with air, and the process for bringing the soot down the chimney may be continued.

Here I beg, for the present, to con-

my suggestions under this head, o hope, that the plans I have sub- d to you may meet with immediate deration from your numerous read- and if approved of, speedy adoption. the barbarous plan of employing children in the most humble of oc- ions (viz. chimney sweeping) stop. us not even wait for the arrival of time, however short it may be, which legislators have fixed on for doing justice to humanity; but let us put wn with one accord immediately. , for a single moment beyond what solutely necessary should we protract sufferings of these poor infants? should my plans not succeed, where e our boasted acquirements in me- ics, if there is not another, ay, ty other plans forthcoming for ef- ng this object? And surely from of these, something like an efficient ss could be obtained—some cheap simple process—some such process e occupants of houses, or their ser- s, could use with facility—some pro- which, from its cheapness, would its adoption—if nothing else could on the feelings—and this attained, ssity, a law stronger than the wisest s could frame—would cause master ps to desist from their wanderings, to withdraw from suffering, and the pitying eyes of every walker of public streets, the wretched objects ur commiseration, the "poor little mney sweeps."

hould this be accomplished from my estions, my gratified feelings will ed amply reward me.

am, Sir,

Your most obedient servant,

JAMES A. EMSLIE.

S.—Sir,—Allow me to add, with ect to the rope and weight-brush e of sweeping chimneys, that the ht may be inserted in the heart of brush, which it can readily be, by ng the whalebone or cane fixed on trong leather, and this sown round weight. The injury the pargetting e flue is said to derive from the ac- of the weight in the method at pre- in use, will, I think, by these means ntirely obviated.

HARTLEY'S FIRE-PROOF BUILDING—FIRE PREVENTIVE COMPANY'S CEMENT.

Sir,—I am sorry that the shortness of Col. Macerone's memory should have betrayed him so much into error on the subject of *fire-prevention*, as at this time to recommend it to my attention. I really imagined that, so far as I was concerned, that topic, if not altogether exhausted, was certainly threadbare.

I have already repeatedly denounced our present highly inflammable mode of house-building—have constantly advocated the general employment of fire-guards, incombustible draperies, and other preventives—and have more than once suggested the "sure preventive," (alum solution,) for rendering cotton and similar fabrics partially incombustible. Mr. Hartley's method of protecting buildings, with all the other intermediate projects for preventing the occurrence or extension of fires, down to the introduction of the "Patent Fire-preventive Cement," have each, at different times, been advocated by me in your by-gone volumes.

The old motto, of "Prevention better than cure," has been conspicuously set forth and illustrated upon many occasions.

I am truly sorry to find that the gallant Colonel entertains such incorrect notions with regard to the fire-preventive cement, which he deridingly describes as "plaster made of Roman cement and size." Had he witnessed any of the highly satisfactory trials and experiments which have been made with this cement, in London and in some of the provincial towns, most of which stand recorded in your journal, he would have been convinced of the antiphlogistic powers of this preparation, and of the vast benefits which must attend its extensive employment. Col. Macerone states that "beams of wood may be charred by fire through iron plates, but will not break into flames without a current of air is admitted." The cement in question is still more efficacious in this respect; the iron being a good conductor of heat, the charring process goes on very rapidly beneath it; the cement, on the other hand, being an excellent non-conductor, the charring goes on much more slowly. In fact, under circumstances where charring would inevitably take place beneath iron plates, it would be completely prevented by the cement.

Colonel Macerone confounds this "cement" with "common plaster;" he might almost as well compare iron to wood.

I beg it to be distinctly understood, that I am not at all disposed to cavil about which is really the best fire-preventive process; right glad should I be to see any protective plan, (even though it were the least efficient,) generally adopted. I am only vexed to see so much apathy prevailing with regard to this subject, that *no preventive measures whatever* are adopted; and even the *cure* is left entirely to those whose sole business it is supposed to be.

So thoroughly incorrigible have we now become, that all the legislative enactments—which, if carried out, would do much to prevent the spread of fire—are become dead letters on the statute-book. Any such preventive law as that suggested by Col. Macerone, at page 60, would be denounced as an outrageous infraction of the "liberty of the subject."

The general employment of incombustible stairs, whether of stone, iron, slate, or even wood effectually protected by cement, would, I have often asserted, and again repeat, completely change the character of London fires. Beyond this, any protection afforded to the partitions, ceilings, &c., either by Mr. Hartley's, or any other effectual process, could not fail to be highly advantageous.

In several recent instances, *public buildings* have been constructed in a fire-proof, or partially fire-proof manner, and it is devoutly to be wished that the same principle may be adopted in *domestic dwellings*, where, although property to an equal amount is not at stake, there are lives to be preserved, which are of far greater consequence.

I remain, Sir,

Yours respectfully,

W. BADDELEY.

London, January 24, 1842.

ON MR. R. ARMSTRONG'S NEW THEORY OF DIFFUSION. BY C. W. WILLIAMS, ESQ.

(Continued from page 63.)

But this Daltonian system of separation-diffusion, (meaning Mr. R. Armstrong's new version of it,) appears to be miraculously endowed with the still more extraordinary, and even discriminating faculty, not only of separating the gases, but of distinguishing those which are useful and combustible from the useless and incombustible! This, indeed, would be "extraordinary—if true." Thus we find that, according to the new version, "the lighter gases, which constitute the most valuable part of the smoke, have, according to Dr. Dalton's law of the 'diffusion of gases,' before referred to, a natural tendency" (not to mingle and become diffused, as Dr. Dalton thought and wrote, but, hear reader,) "to *leave* the carbonic acid gas," (itself the heaviest of them all,) and rush into the ash-pit, as into a vacuum; at the same time carrying the light carbonaceous matter with them." Mr. Armstrong may well say of Mr. Cheetham's plan, which brings such impossibility-working into action, "I believe it to be one of the greatest discoveries of modern times." He might with the greatest safety have said, the *very greatest*.

But he describes another peculiarity, with respect to the diffusive faculty of atmospheric air, which the great Dalton himself never even dreamed of, and which is thus referred to. "The atmospheric air, which is essential to support the combustion of those gases, not having this diffusive tendency to so great an extent, (how this curious fact has been ascertained does not appear,) requires to be supplied by artificial means, and for that purpose a *very small* fan is necessary." Hear that, Dalton and Graham, whose names are pressed into the service of this new theory of diffusion. Mr. A., with great sagacity and penetration, (that is, the penetration which enables him to see farther into the mill-stone than the man who picks it,) observes, "Here the question will no doubt occur to many, as to what is the probable effect of this necessary strong draught, or blast, against the boiler bottom," (from the 'very small fan!') This, we are told, is an important question; but he adds that, "fortunately, it admits of being easily answered by any *chemist* who duly considers, (and understands,) the *rationale* of the process as above given." Undoubtedly—for any chemist who can understand, not the *rationale*, but, in plain English, the absurd nonsense of "the process as above given," can have no difficulty in answering any question.

e have a still more curious de-
nt of the new theory, by which
that the hitherto supposed *in-*
consequence of a mixture of in-
ible with combustible gases, (as
d accurately shown,) is actually
d into a most salutary and useful
by virtue of a "*diluting*" process.
theory, however, speak for itself.
ver, as these changes and com-
s are being continually and rapidly
and are, in this case, carried on
tmosphere, (so to speak,) sur-
with a certain portion of nitrogen
am, which, being neither sup-
nor combustibles, but being pro-
y the fan," (oh, this magic "little
" in uniform mixture with other
luids that possess these properties
minent degree, there can be no
(I ask, will any one take the
"to doubt" on the subject?) But
process of *double combustion* (!)
o incombustible substances, (ni-
and steam) effect the very im-
purposes of *diluting* and *modify-*
oxydating property of the blast."
ng the oxydating property of the
! This certainly is enough to
ray a man's breath. Nitrogen
ing the very important purpose
ing the oxydating property of at-
ric oxygen!

let us hear the expounder of this
ory out. "In fact, the peculiar
of elastic fluids thus effected,"
e diluting process,) "produces
, I believe, called by some mi-
ists, and others, conversant with
w-pipe, the "*deoxydizing flame.*"
entity between the "deoxydizing
of the blow-pipe, and the useful
ing process," of mixing atmosphe-
with nitrogen and steam to effect
le combustion, and modify the
strength of "crude air," is truly
ous.

his, however, high Dutch, or low
we are told that, "At any rate,
ur result is characteristic of Mr.
am's process, in contradistinction
ordinary process of blowing the
th *crude air*," (crude air! too
by half for either mortals or com-
es, until diluted with nitrogen and
) "which latter method, whenever
d to, has always effected the rapid
ion of the grate bars, *and the de-*
n of the furnace." *Attend to this,*
ye advocates for hot air and cold air, and the introduction of "*crude air*," hitherto erroneously, no doubt, called "*pure air.*" Behold this new recipe to make your furnace burn well,—dilute your "crude air" with nitrogen and steam, and thus you will obtain that valuable result, viz. the deoxydizing effect of the mineralogist's blow-pipe. This is true by the mass! For we are now told that, "according to Mr. Cheetham's plan, when the *smoke itself* is actually made, in part, the medium for blowing the fire, the draught produces a totally different result," (not a doubt of it,) "while the manner of effecting it is as complete and simple as it is *unique*, in its application to steam-engine furnaces." *Unique*, in truth, it is. Unquestionably this process may well be described as one by which the smoke itself shall be made the medium of blowing the fire so as to produce that great desideratum, the unique, diluting, and deoxydizing effect, of modifying the injurious action of "crude air."

In sober earnest, Mr. Editor, I ask, is it not lamentable to think how real improvements in the arts may be retarded—how business men may be led astray, and many gulled by such seeming-wise, but utterly nonsensical, theories as this?

The paper, too, which I have just reviewed comes from that very individual who, in a letter in the *Mechanics' Magazine*, last year, elaborately condemned the principle recommended in my Treatise on Combustion, as being chemically and practically wrong. That he should have come to that conclusion appears natural, seeing that the principle I advocated was in accordance with the hitherto received notion, that Dr. Dalton's diffusion meant the intimate intermingling of gases—whereas, Mr. Armstrong's condemnation of the principle was on the idea, that the Daltonean diffusion meant "separation," and the one class of gases "leaving" the other.

I may also state another fact, proving that Mr. Armstrong sees what no other man can see, and which is the only way I can account for his new theory of diffusion—namely, that before there was a single furnace erected by me or by my direction, for carrying out my principle, save my own and that at the Liverpool Water Works, (neither of which he had seen,) he sat down and deliberately penned the following passage, in a report by

him on the supposed principle of my furnace—"I have long paid great attention to the operation of smoke burning furnaces generally, and more particularly to those constructed on the principle so imperfectly attempted by Mr. Williams." (And again, still having never seen a single furnace of my construction.) "This *conviction* has been forced upon me by a careful and unprejudiced examination, (careful and unprejudiced!) of a great many steam engine furnaces, erected both by myself and others, including several constructed by Mr. Williams himself." What, Sir, will honest, well meaning men say of such "careful and unprejudiced examination," seeing that when called on he was unable to point to a single one which could justify the slightest ground for the word "examination," and for the plainest of all reasons, namely, that none such were in existence at the time this (wisely undated) report was written.

For the sake of truth, however, and to do justice to Mr. Armstrong, I must state that he subsequently consented to a letter of recantation, and wrote to my agent, stating, among other things, as follows: "I find that the opinions expressed in my report before named, were formed on erroneous data, and therefore calculated to mislead. I therefore consider it due to the public and the inventor, and not less to yourselves, to make this explanatory statement, as I find my report has been misconstrued and circulated to your injury, and as you have expressed your satisfaction with this explanation, and agreed, at my request, to waive any legal proceedings in respect to such injury."

This paper, my solicitor states, Mr. A. consented to sign, on three conditions, (dictated by himself,) one of which was, "that it is not to be published or circulated, but only referred to at the office of the solicitor." Having subsequently evaded the actual putting of his name to the paper, (as if that were of any importance, after having admitted its necessity and correctness,) I feel absolved from the restriction as to publication. The verbal admission of his error (and consent to sign,) was in fact as satisfactory as a written one.

I am, Sir, yours, &c.

C. W. Williams.

Liverpool, Jan. 17, 1842.

PLATING BY ELECTRIC PRECIPITATION.

Sir,—I see in No. 956 of your Magazine a letter from Mr. Walker, claiming certain improvements in the electrotype, for which patents have been taken out by others; but in my opinion, neither Mr. Walker, nor any other person has a right to take out a patent for either electro-plating or gilding, as the matter was made public by Mr. Sturgeon in his Annals of Electricity, very soon after the original discovery of the electrotype by Mr. Spencer, in a letter to that gentleman inserted in the work above mentioned. Mr. Sturgeon says in the letter referred to, "You will remember the idea occurred to me of giving medallions, coins, &c., taken by the process of voltaism, silver, or golden surfaces, by a similar voltaic process, employing a solution of either of those metals with the prepared matrix instead of a solution of copper.

From your obedient servant,

A Country Subscriber.

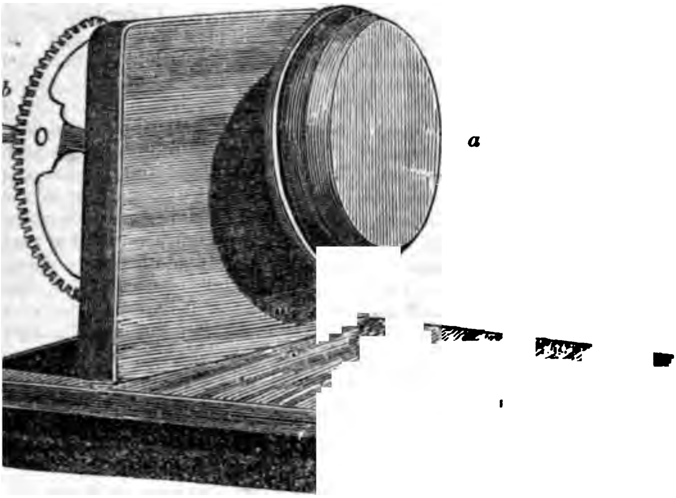
FENN'S REVOLVING OIL STONE.

[Registered pursuant to Act of Parliament.]

It frequently happens, that nearly as much skill is required in preparing and sharpening tools as in the subsequent use of them; and in the case of engravers in particular, success depends greatly upon the care bestowed upon the sharpening of their gravers. It is in many cases of the highest importance, that a *precise angle* should be maintained between the face and the belly of the tool, and the attainment of this desideratum by a backward and forward motion upon a stone lying in a horizontal plane, is a work requiring more than an ordinary degree of skill for its successful execution; a skill, in which those who possess it, justly pride themselves.

In order to obviate the greater portion of the difficulty which presents itself in the attainment of this object, Mr. Fenn, the well known tool-maker, of Newgate-street, has registered an ingenious little contrivance which is shown in the annexed engraving, by means of which any artist, or amateur, may readily ensure a fine edge of the required form for his gravers. It consists of a small disc of turkey stone *a*, mounted upon a suitable holder and axle, which has a small pinion

s outer end on the opposite side of upporting side frame or bracket; a plying wheel *b*, furnished with a le, takes into and drives the pinion. nall quantity of oil being spread on the surface of the revolving hone with a piece of woollen cloth, the tool is held against it at the required angle, and the stone made to revolve by turning the wheel *b*.



ie advantages of this contrivance, st in producing with little care, and great facility, any desired angle on lge of every description of tools; the stand forming a rest for the right which holds the tool, while the left the necessary motion to the hone. vertical position of the hone, also es the operator to see from time to the angle which is being formed on ool, while the smallness of the stone tates the employment of those of the very best quality only, and supersedes the use of any containing flaws or imperfections, which it is difficult to avoid when long slabs of stone are required as in the ordinary modes of sharpening edged tools. The continuity and rapidity of the motion thus produced, soon effect the desired sharpening. We have no doubt that the advantages of this contrivance will soon cause its very extensive, if not universal employment among artists.

THE SUPPOSED PERCUSSIVE ACTION OF STEAM.

,—Mr. Parkes appears to me to fallen into an error which many philosophers have done before him, that of inquiring more into *causes* *effects*. He imagines that, accord- the recognised laws of expansion, ater portion of work is performed e Cornish pumping engines than team used would warrant us to ex- and without taking into considera- he possibility that his calculation of *ffect* produced may be erroneous, *ts off into the regions of fancy* in search of a *cause:* this cause he styles the "percussive action."

The first idea which the word "percussive" gives rise to is, that of the steam travelling through a partially vacuous space before it comes in contact with the piston, and acquiring through that motion a force similar to that acquired by any body in falling; or moving in any direction with a continuous propelling power applied to it. Such, however, cannot be the view taken of the subject by Mr. P., or he must obviously

be in error, as decidedly the reverse of percussive action is produced by so admitting the steam; for however rapidly a body of steam may flow into a partial vacuum, it must expand far more rapidly; and the outward portion, or that which falls on the piston first, will necessarily be attenuated in a great degree, and impart a force thereto little exceeding that of the partial vacuum which previously existed.

If, then, the travelling—if I may so speak—of the steam gives diametrically the reverse of "percussive action," we shall gain a maximum of this imagined force when the vacuous space through which the steam has to travel, between the induction valve and the piston, is the smallest that can be obtained. This is so palpably plain, as to admit of no dispute on the subject; and yet, if Mr. P. admits it to be the case, his theory at once falls to the ground. Let us imagine, for instance, a cylinder having a piston *fixed* in any part of it. Above this piston let us imagine a slide of inappreciable thickness, yet strong enough to bear the whole pressure of the steam, and placed so as not to touch the piston, yet at an inappreciable distance from it, and let the induction port be double or treble the usual size. Now, suppose the steam to be full on, and pressing on the slide with a force equal to 1,000 lbs., can we, without risking a charge of absurdity, imagine it possible that, by suddenly withdrawing the slide, the steam may be made to exert a force on the piston, exceeding that which it had previously exerted on the slide? If it would exert this extra force, whence comes it? The body of steam has not moved an appreciable distance, and consequently cannot have acquired an appreciable momentum; and I have just shown that, if it *had* moved, the reverse of percussive action must have resulted. This is so obvious, that I may be charged with prolixity in giving further illustration; nevertheless, I will say a word or two more.

If, by suddenly withdrawing the slide, the steam is made to exert a force of 1,500 lbs. on the piston, instead of 1,000 lbs., (the pressure it previously exerted on the slide,) the same, or nearly the same, effects must be produced on the parts of the cylinder submitted to the action of the steam; and, consequently, if a mercurial gauge were fixed a little above the slide, and marked a pressure of 40 lbs., the mere abstraction of the slide would cause the quiescent mercury to rise suddenly, and mark a pressure of 60 lbs.; and yet, all that we have done to the steam has been to substitute one base for another. If such an effect were possible, we may draw from it the most extravagant conclusions; for if a number of these cylinders, pistons, and slides were fixed directly to a boiler, the simple abstraction of one slide would suddenly raise the force in the boiler from 40 to 60; and if, at the precise moment when the steam was exerting this 60 lbs. force, another slide were suddenly withdrawn, the pressure would be raised to 90 lbs.; and if another were then withdrawn, it would be raised to 135 lbs.; and so on *ad infinitum*. Your readers will, I doubt not, smile at the absurdity of such a calculation, but those who are inclined to weigh the matter, will find that the idea is arrived at by strictly inductive reasoning; and, absurd as it is, it must hold good, as long as this "percussive theory" does.

Such, or nearly such, were the ideas which occurred to me when this theory first came under my notice; but as I imagined Mr. Parkes advanced it merely as an opinion, I took no further notice of the subject. I find, however, from a subsequent paper of Mr. P.'s, that he still upholds his theory, and brings forward what he seems to consider indisputable arguments in its support.

I have not the abstract of his last paper by me at present, but, if I recollect right, he states that if a mercurial gauge be attached to the cylinder, the sudden impact of the steam will cause the mercury to rise high enough to denote a pressure of 60 lbs. per inch, when the pressure of the boiler is only 40 lbs.; and that when the steam is admitted gradually, no such effect is produced. I believe 40 to 60 are the proportions; but at all events we will assume it to be so, for the sake of round numbers. Mr. P. also states, that in the larger engines the cylinder covers are deflected, or bulged outwards, when the steam is admitted suddenly; but when slowly, no such effect is produced.

Now, to a merely casual observer, these two arguments seem to tell strongly in favour of the "percussive theory;" but when examined into, we find them to result from causes entirely independent

additional, or "percussive force." regard to the first argument, I ask, how can Mr. P., or any one nagine it possible that a stream of y driven 100 inches, with the elocity it must acquire from hav- great an unbalanced pressure on de, would suddenly stop and re- uiescent, when it had risen a suf- height to balance the pressure of am? The momentum acquired h a velocity would be sufficient to the column considerably higher, ough the whole pressure of the were instantaneously removed he gauge marked its proper level. then, ought to be the effect when mentum is aided by the continued re of the steam? *Theoretically*, of mercury under such circum- should rise to double the height ted by the pressure of the steam; ed means were adopted to prevent lumn acquiring additional length ght after it had reached the 100. *cally*, of course, such an effect be obtained. The deflection of inder cover is, apparently, a more y argument; but if analysed, is to result from an entirely different to that assigned by Mr. P. Be- owever, we investigate this point, request your readers to bear in that in the engines Mr. P. ex- nted on, although the pressure of iler was about 100 inches of mer- that of the steam in the cylinder ly about 75, with the steam full wing, of course, to the velocity of ston being too great, or the induc- o small to admit of the steam flow- with sufficient rapidity.

r, let us imagine an engine to be g under such circumstances, the at the top of the cylinder, and the admitted suddenly. The space n the cylinder cover and piston small, in comparison to the size of duction port, is almost instantly d with steam of nearly equal pres- ith that of the boiler; before this can be enlarged, the *vis inertia* of mense mass of matter, comprising iston, beam, pump-rods, &c., and ials to be lifted, has to be over- and sufficient time will be required this, to admit of the pressure above ston becoming equal to that of the *This pressure is sufficient* to bulge or force the cylinder cover outwards. As soon as the piston begins to move, the pressure gradually decreases from 100 to about 75, and the cylinder cover assumes its proper form. I need not enter into any elaborate argument to show why the cylinder cover is not deflected when the valve is opened slowly, as every one, who knows any thing of the steam-engine, knows there is a great loss of power occasioned by so admitting the steam—not owing to the loss of "percussive force," but owing to the wire-drawing and undue expansion, which is the natural result of admitting the steam too slowly.

If I am rightly informed, Mr. P. in his calculation of the effect produced by the Cornish engines, takes the maximum pressure of the steam in the cylinder at 27 lbs.; which 27 lbs. is continued during one-sixth of the stroke, the steam being expanded during the remaining five-sixths. If this be his mode of proceeding, he is not likely to arrive at a just conclusion, as to the relative quantities of steam consumed and work done; as it is obvious that the steam is exerting a pressure nearly equal to that of the boiler at the commencement, when the piston is moving very slowly; which pressure decreases as the velocity of the piston increases, and consequently expansion is going on during the whole of the stroke, instead of only during five-sixths.

Not being thoroughly conversant with the action of Cornish engines, I should incur a risk of error in speaking thereon; therefore, I wish it to be borne in mind, that the following remarks on the crank are not made in reference to them. My reason for speaking on this subject is in reply to an assertion of Mr. Parkes, that a crank engine cannot possibly realize the advantages gained by a non-rotative; and I see by a reference to the patent list, that a patent has lately been taken for machinery to be used as a substitute for the crank, probably with a view to obviate the supposed disadvantages assigned to it by Mr. P. Now, as far as I can perceive, a pumping engine, regulated by a crank and fly-wheel, would realize more advantage than a non-rotative, especially while the latter labours under such a palpable disadvantage as the one Mr. Parkes experimented on, viz. not admitting the steam with suffi-

cient rapidity to keep up a due pressure in the cylinder when the steam is full on. In a crank engine, the extreme slowness of the piston during the first part of the stroke, allows sufficient time for nearly the full pressure of the steam to be maintained in the cylinder; and consequently, much more may be admitted during one-eighth of the stroke, than Mr. P. obtained in one-sixth. I should imagine there would be considerable difficulty in arranging a merely reciprocating engine, in such a manner as to keep up a full pressure while the steam is on; as such a pressure cannot be maintained unless the piston is loaded so as to offer a certain modicum of resistance; and if the load be thus increased, the weak expanded steam at the end of the stroke will not be sufficient to keep the load in motion. With a crank and fly-wheel, both these disadvantages may be obviated: the slow motion of the piston at the commencement of the stroke, allowing the admission of nearly full pressure steam; and the momentum of the fly-wheel, acting, as it does, with a gradually increasing leverage from the middle of the stroke, admitting of the steam being expanded to any degree of rarity above that required to overcome the friction, &c.

Yours, respectfully,

J. BRITTEN.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

SIR SAMUEL BROWN, KNIGHT OF THE ROYAL HANOVERIAN GUELPHIC ORDER, COMMANDER IN HER MAJESTY'S NAVY, OF NETHERBYERS-HOUSE, AYTON, BERWICKSHIRE, *for improvements in the means of drawing or moving carriages and other machinery along inclined planes, railways, &c., and for drawing or propelling vessels on canals, rivers, and other navigable waters.* Enrolment Office, December 18, 1841.

The first part of this invention relates to a mode of propelling carriages by means of a ground chain. For this purpose a cranked axis, turning in suitable bearings upon the framing of the carriage, and driven by connecting-rods from the steam cylinder, carries a cog-wheel and a chain-wheel. Two other axes also carry respectively chain-wheels and cog-wheels, which are driven by the former. On motion being given to the machinery, a ground-chain is progressively picked up, and passing under the wheel on one axis and over the other, is laid down again, and the carriage thereby propelled along.

The second part of the invention consists in the application of similar machinery on board a vessel, for propelling it.

The claim is, 1. To a mode of propelling carriages by means of wheels or endless chains, worked by suitable gearing, and acting with a ground-chain; 2. To a mode of warping vessels by means of wheels or endless chains, worked by suitable gearing, and acting with a chain of single links, whereby one chain is rendered sufficient for the passage of vessels in opposite directions at the same time.

JAMES HENRY SHAW, OF CHARLOTTE-STREET, BLACKFRIARS-ROAD, JEWELLER, *for improvements in setting wheat and other seeds.* Enrolment Office, December 18, 1841.

These improvements consist in furnishing means by which given quantities of wheat or other seeds may be set at regular intervals apart. A frame is mounted on two running wheels; two smaller wheels are also applied to side frames in front of the machine, which admit of adjustment, so as to regulate the depth of furrow produced by the ploughs, which are fixed in the front rail of the framing by wedges. On the nave of one of the running wheels a cog-wheel is fixed, which, by means of a clutch-box, can be thrown into or out of gear, with a corresponding cog-wheel on the axis of a seed cylinder. This cylinder is divided into a number of compartments, corresponding to the rows of seeds to be deposited. Around each compartment there is an apparatus for regulating the quantity of seed, and depositing it at the prescribed distances apart.

The seed passes down rectangular tubes, the lower ends of which are kept closed by spring valves, which are opened at proper intervals, and to a proper distance, by a series of curved bars affixed to the machine.

The claim is to combining mechanical apparatus into a machine, by applying depositing apparatus, and suitable parts connected therewith, to a revolving cylinder.

WILLIAM CHESTERMAN, OF BURFORD, OXFORD, GENTLEMAN, *for improvements in filtering different liquids.* Enrolment Office, December 21, 1841.

Under this deceptive title we are presented with another new coffee-pot, which seems to us to be an inferior modification of the very excellent contrivance of Mr. Platow.

This coffee-pot is made of tin plate, with a wooden handle attached horizontally to one side of it; a hole is made in the bottom of the vessel, to admit a heater to enter a tube which passes up the centre of the pot. The ground coffee being placed in the vessel,

and boiling water poured upon it, the mouth of the coffee pot is fitted with a strainer, and the vessel reversed. The hot heater is then dropped into the tube, which causing the rapid generation of steam, forcibly expels through the strainer or filtering material, the clear decoction of coffee, which is received in a suitable vessel for serving.

The claim is to the mode of constructing apparatus to act as a filter, being inverted, and aided by the application of heat.

John White Welch, of Austin-Friars, Merchant, *for an improved reverberatory furnace to be used in the smelting of copper ore, or other ores which are or may be smelted in reverberatory furnaces.* (A communication.) Rolls Chapel Office, January 21, 1842.

This furnace has two chimneys or flues, leading away in opposite directions from the circular basin or body of the furnace to two upright chimney-stacks, by means of which the requisite draft is obtained. A rapid current of flame, heated smoke, gas, and air, proceeds from the fire in a fire-place situated on one side of the furnace, over a low wall, called the fire-bridge, into the body of the furnace, at the upper part thereof, and, striking against the arched dome, is deflected or reverberated downwards upon the ores, or other matters lying on the floor of the furnace, and being divided into two currents, passes away to the chimneys. The heated gases, &c., are deflected down upon any ores, &c., which may be placed in the passages, which slope downwards towards the body of the furnace. The ores are fed into these passages from hoppers placed above, and as they become roasted or calcined, are pushed down into the main body of the furnace, by means of iron rabbles introduced through suitable openings made for that purpose.

Furnaces thus constructed are said to be applicable to the calcining or melting of copper or other ores, previously prepared and mixed in the usual manner.

The claim is to the improved reverberatory furnace before described; the novelty and the chief distinction between such improved furnace and those in common use being, that the current of flame, heated smoke, gas, and air, which proceeds, in the usual manner of ordinary reverberatory furnaces, from the fire-place, and over the fire-bridge into the body of the furnace, (instead of proceeding onward away from that body by one flue or passage to the chimney, as is the case in ordinary furnaces,) in the improved reverberatory furnace divided into two separate currents, which pass away laterally from the body of the furnace in opposite directions, in order to go by two distinct flues or passages to the chimneys; in each of which flues or passages part of the ore, (regulus or imperfect metal,) which is to be operated upon may be placed, so as to receive a heating action from the divided currents of flame, heated smoke, air, and gas, passing through each of the said passages respectively; so that two flues or passages, both having ore in them, are heated by the same fire, and with an economy of fuel. The improved reverberatory furnace may have two distinct vertical chimneys; or the said two vertical chimneys may be brought together into one vertical stack or chimney, by means of suitable flues or passages extending from the lowest part of the two vertical chimneys, to lead into the lower part of the said one stack or chimney, if that mode is preferred.

William Ward Andrews, of Wolverhampton, Ironmonger, *for an improved coffee-pot.* Enrolment Office, January 21, 1842.

Within the body of the coffee-pot is placed a perforated box furnished with a movable top, which is held on by a clutch and ring; within this perforated box, and connected with it, is a perforated pyramid or cone, the base of which communicates with a water-passage at the bottom of the coffee-pot; at the back of the coffee-pot, close to the handle, there is a forcing-pump fitted with a solid piston or plunger, and near the top of the pump-barrel there is a lip and cover, for pouring in boiling water. The piston being raised to the top of its working-barrel, boiling-hot water is poured into the lip, which flowing down the pump-barrel, passes along the water-passage, up through the perforated cone, into the perforated box in which the ground coffee had been previously deposited, and thence into the body of the coffee-pot. The piston is then forced down, which drives the small quantity of water contained in the pump-barrel through the coffee-box into the body of the pot, whence it can be drawn off by a spout of the usual construction.

The patentee claims "the improved coffee-pot, as described, whereby I am enabled to force the boiling-hot water, *of which the coffee is to be made*, by means of a solid piston and force-pump, through the coffee, while the coffee is contained in a fixed closed and perforated box."

Neither the mode of using, nor the advantages supposed to be obtained by this improvement, (?) are by any means clearly set forth in the specification. Whether the pumping action is to be continued for any length of time, or whether the magic influence of one small quantity of water forced through the coffee by manual pressure, while

another quantity has accomplished the same journey by gravity alone, is the wonder-working agent, the patentee sayeth not. One thing only is clear, that the patentee is to make such coffee by his cunningly contrived pot, as nobody before him ever made; whereas other people usually make t coffee from the berry so called, Mr. A. t us he makes his "of boiling-hot water."

COPYRIGHT OF DESIGNS—CASE OF INFRINGEMENT.

At the Petty Sessions at Dudley, on Monday last, Mr. Jeffrey Finch, fender-maker, of that place, was convicted in a mitigated penalty and costs, for selling fenders whereon the registered design of Mr. James Yates, of Effingham Works, Rotherham, had been used. This proceeding took place under the recent statute for securing to proprietor designs for articles of manufacture the co right of such designs; and it is hoped it operate as a caution, and prevent future fringements.—*Aris's Birmingham Gaz Jan.* 17, 1842.

LIST OF DESIGNS REGISTERED BETWEEN DECEMBER 21ST, AND JANUARY 29TH, 18

Date of Registration.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for wl protectio is grantec
1841.				
Dec. 22	985	William Marr	Lock	3 yea
23	986,7	H. Longdon and Son	Fender	3
"	988	James Barlow	Steamer	3
"	989	H. Davies	Elliptograph	3
24	990	George Wadsworth	Spur-box	3
"	991	Edward Perry	Vase	3
"	992	W. C. Stamp	Bath	3
"	993	The Falkirk Iron Company	Stove	3
"	994	H. H. Russell	Slate fastenings for roofs	3
28	995	Insole and Jones	Harness backband tug	3
"	996	John Jones	Compass watch	3
29	997	Plowman and Quarterman	Threshing machine	3
"	998	William Plowman	Reading table	1
30	999	James Eagles	Brush	3
"	1000,1	Thomas Hopkins	Carpet	1
"	1002	Kidston and Company	Jug	1
"	1003	Ditto	Bowl	1
"	1004	Ditto	Jug	1
Jan. 3	1005	Ditto	Plate	1
"	1005	W. W. Nicholson	Stove	3
4	1007	Thomas H. Ryland	Screw plate	3
"	1008	Ditto	Fastenings for trowsers	3
"	1009	Edward Perry	Coal or coke-box	3
7	1010	William Hancock, jun	Nail ornament	3
10	1011,2	Woodwell, Gundell and Co.	Carpet	1
"	1013	Lewis and Co.	Parallel motion for pump work	3
11	1014,18	James Boswell	Stained paper	1
"	1019,20	Ralph Wilson	Button	3
12	1021	Miller and Bankier	Lamp post	3
"	1022,35	William Evans	Stained paper	1
"	1036,39	H. I. and J. Dixon	Carpet	1
14	1040	Lea and Co.	Ditto	1
"	1041	Joseph Fenn	Coach wrench	3
17	1042	H. Longden and Sons	Stove	3
"	1043	Mrs. Sarah Cooke	Plate-warmer	3
18	1044	James Yates	Stove	3
"	1045	Ditto	Fender	3
"	1046	Thomas Glover	Ploughshare	3
"	1047	William Sibson Alderton	Pen holder	1
"	1048	John Beckett	Metallic plate	3
"	1049,61	H. N. Turner and Co.	Stained paper	1
21	1062,3	Southwells and Co.	Carpet	1
"	1064	Joseph Hoy	Railway signal hand lamp	3
24	1065	James Verily	Clog fastening	3
"	1066	Lea and Co.	Carpet	1
"	1067	Fleming and Neill	Cooking apparatus	3
26	1068	Mapplebeck and Lowe	Coal vase	3
"	1069	T. Finnemore	Pen	3
"	1070	William Polyblank	Improved lamp	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 21ST OF DECEMBER, 1841, AND THE 27TH OF JANUARY, 1842.

John Watson, of Chorley, Lancaster, Gentleman, for improvements in the construction of filters used in the manufacture of sugar. Dec. 23; six months.

William Baillien, of Gloucester-street, Queen's-square, Bloomsbury, musician, for improvements in apparatus to expand the human chest. Dec. 23; six months

William Robinson Kettle, of Waterloo-street, Birmingham, Accountant; Benjamin Wakefield, of Ryland-street North, Birmingham, civil engineer; and William Crosher, of Cumberland-street, Birmingham, screw manufacturer, for an improved bolt for building and other purposes. Dec 24; six months.

Montagu Macdonough, of St. Albans-place, Middlesex, gentleman, for improvements in spindles, flyers, and bobbins, for spinning, twisting, and reeling all sorts of fibrous or textile substances; and in the application or adaptation of either or all of them to machinery for the same purposes. (Being a communication.) Jan. 6; six months.

Edward Hall, of Dartford, civil engineer, for an improved steam-boiler. Jan. 11; six months.

Samuel Hearne Le Petit, of St. Pancras-place, Middlesex, for improvements in the manufacture and supply of gas. (Being a communication.) Jan. 11; six months.

James Chesterman, of Sheffield, mechanist, and John Bottom, of Sheffield, aforesaid, mechanist, for certain improvements in tapes for measuring, and in the boxes for containing the same. Jan. 11; six months.

Charles Wye Williams, of Liverpool, gentleman, for certain improvements in the construction of furnaces, and effecting combustion of the inflammable gases from coal. Jan. 11; six months.

John Tresahar Jeffree, of Blackwall, engineer, for certain improvements in lifting and forcing water, and other fluids, parts of which improvements are applicable to steam engines. Jan. 11; six months.

Richard Dover Chatterton, of Derby, gentleman, for certain improvements in propelling. Jan. 11; six months.

James Tone, of Newcastle-upon-Tyne, gentleman for improvements in smelting copper ores. Jan. 13; six months.

Julius Bordier, of Austin Friars, merchant, for certain improvements in preparing skins and hides, and in converting them into leather. Jan. 13; six months.

Caleb Bedells, of Leicester, manufacturer, and Joseph Bedells, of the same place, for improvements in the manufacture of elastic fabrics, and articles of elastic fabrics. Jan. 13; six months.

Joseph Barnes, of Church, near Accrington, Lancashire, manufacturing chemist, for certain improvements in the working of steam engines. Jan. 13; six months.

Henry Waterton, of Winsford Lodge, Chester, Esq., for improvements in the manufacture of salt. Jan. 13; six months.

John Jeremiah Rubery, of Birmingham, umbrella and parasol furniture manufacturer, for improvements in the manufacture of a certain part of umbrella and parasol furniture. Jan. 13; six months.

Moses Poole, of Lincoln's-inn, gentleman, for improvements in the construction of locks. (Being a communication.) January 15; six months.

John Thackeray, of Nottingham, lace thread manufacturer, for improvements in the process of preparing and gassing thread or yarn. January 15; six months.

Thomas Lambert, of Regent's-park, musical instrument maker, for improvements in the action of cabinet pianofortes. January 15; six months.

Edward Palmer, of Newgate-street, philosophical instrument maker, for improvements in producing printing and embossing surfaces. January 15; six months.

James Cole, of Youl's-place, Old Kent-road, brush manufacturer, for certain improvements in the construction of brushes. January 15; six months.

Cornelius Ward, of Great Titchfield-street, musical instrument maker, for improvements in flutes. January 18; six months.

William Tindall, of Cornhill, ship-owner, for a new and improved method of extracting or manufacturing from a certain vegetable substance certain materials applicable to the purposes of affording light, and other uses. January 19; six months.

Antoine Mertens, of the London Coffee-house, publisher, for improvements in covering surfaces with wood. (Being a communication.) January 22; six months.

William Baker, of Grosvenor-street, Grosvenor-square, surgeon, for certain improvements in the manufacture of boots and shoes. January 27; six months.

John James Baggaly, of Sheffield, seal engraver, for certain improvements in making metallic dies and plates for stamping, pressing, or embossing. January 27; six months.

Andrew Kurtz, of Liverpool, manufacturing chemist, for certain improvements in the manufacture of artificial fuel. January 27; six months.

Francis Marston, of Aston, Salop, esquire, for improvements in apparatus for making calculations. January 27; six months.

Samuel Mason, of Northampton, merchant, for improvements in clogs, part of which improvements is applicable to shoes and boots. January 27; six months.

Gottlieb Boccius, of the New-road, Shepherd's-bush, gentleman, for certain improvements in gas, and on the methods in use, or burners for the combustion of gas. January 27; six months.

William and John Galloway, and Joseph Hally, of Manchester, engineers, for certain improvements in machinery for cutting, punching, and compressing metals. January 27; six months.

Pierre Journet, of Dean-street, Soho, engineer, for improvements in steam-engines. (Being a communication.) January 27; six months.

Henry Benjamin, of Saint Mary-at-Hill, fish-factor, and Henry Grafton, of Chancery-lane, philosophical instrument-maker and machinist, for improvements in preserving animal and vegetable matters. January 27; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND BETWEEN THE 28TH OF DECEMBER 1841 AND THE 22ND OF JANUARY, 1842.

John Juckes, of Lewisham, Kent, gentleman, for improvements in furnaces or fire-places. Sealed December 28.

Montagu Mac Donough, of Saint Alban's Place, Middlesex, gentleman, for improvements in spindle flyers and bobbins for spinning, roving, twisting, and reeling all sorts of fibrous or textile substances, and in the application or adaptation of either or all of them to machinery for the same purposes. (Being a communication.) Sealed January 4.

Thomas Joseph Ditchburn, of Orchard-house, Blackwall, Middlesex, ship-builder, for certain improvements in ship-building, some or all of which are applicable to steam-boats, and boats and vessels of all descriptions. January 6.

Moses Poole, of Lincoln's Inn, Middlesex, gentleman, for improvements in preparing matters to be consumed in obtaining light, and in the construction of burners for burning the same. (Being a communication from abroad.) January 7.

William Petrie, of Croydon, Surrey, gentleman, for a mode of obtaining a moving power by means of voltaic electricity, applicable to engines, and

other cases where a moving power is required. January 7.

James Taylor, junior, smith and engineer, Turner's-court, Glasgow, for a self-acting machine for driving piles and stakes, and for other such purposes, to be wrought by steam or other power. January 10.

John George Bodmer, of Manchester, Lancaster, engineer, for certain improvements in the construction of screwing stocks, taps and dies, and certain other tools, or apparatus, or machinery, for cutting and working in metals. January 13.

William Petrie, of Croydon, Surrey, gentleman, for improvements in obtaining mechanical power. January 13.

Alphonse Rene Le Mire de Normandy, of Red Cross-square, London, doctor of medicine, for certain improvements in the manufacture of soap. January 13.

Henry Hough Watson, of Bolton le Moors, Lancaster, consulting chemist, for certain improvements in dressing, stiffening and finishing cotton, and other fibrous substances, and textile, and other fabrics, part, or parts of which improvements are applicable to the manufacture of paper, and also to some other processes, or operations connected with printing calicoes, and other goods. January 18.

John Lee, of Newcastle-upon-Tyne, manufacturing chemist, for improvements in the manufacture of chlorine. January 19.

John Thomas Carr, of the town and county of Newcastle-upon-Tyne, for improvements in steam engines. (Being a communication.) January 19.

Robert Stirling Newall, of Gateshead, Durham, wire rope manufacturer, for improvements in the manufacture of flat bands, and in machinery for the manufacture of wire ropes. January 20.

LIST OF PATENTS FOR IRELAND GRANTED IN DECEMBER, 1841.

J. C. Daniell, for improvements in the manufacture of manure, or composition to be used on land as manure.

R. Logan, for improvements in obtaining and preparing the fibres and other products of the cocoa nut and its husk.

Captain J. N. Taylor, for a certain method, or certain methods, of abating or lessening the shock or force of the waves of the ocean, lakes, or rivers, and of reducing them to the comparatively harmless state, known by the term of "Broken-water," and thereby preventing the injury done to, and increasing the durability of breakwaters, moleheads, &c., and also of adding to the security and defence of harbours, roadsteads, anchorages, and other places exposed to the violent action of the waves.

R. Holt, for improvements in machinery or apparatus for the production of rotary motion for obtaining mechanical power, which said improvements are also applicable for raising and impelling fluids.

NOTES AND NOTICES.

Fire-proof Cement.—Mr. Martin, of Blackfriars-road, has invented a fire-proof cement, which has been already used at the Earl of Sefton's residence, in Belgrave-square, at Stafford-house, &c., and which, we are informed, is intended to be used by Mr. Barry, the architect, at the new Houses of Parliament.—*Court Journal.*

Mr. Barry has done himself a great deal of credit by his decision on this subject, and we shall be glad to find his example followed by other surveyors of public buildings. We would more particularly allude at present to the British Museum and National Gallery, the *literally* invaluable contents of which are in hourly danger of destruction from the combustible nature of the floors and linings of the walls, and the *tinder-ish* state in which they are kept by the hot air and water flues running under or alongside of the wood-work. Since Mr. Martin's fire-proof composition has been brought forward, there is no excuse whatever for exposing these, or any other of our public institutions, to the danger of conflagration. The composition alluded to is the same which Mr. Cubitt, the eminent builder, has employed at his extensive factory at Thames Bank, in place of wood, for almost every purpose to which the latter is applicable in buildings. It has been also used for floorings, to a considerable extent, in the new houses which Mr. Cubitt is engaged on in Belgrave-square and its neighbourhood. — Ed. M. M.

Mostyn Foundry Marine Steam-engines.—On Thursday last a new steamer, called the *Taliesin*, was launched at the building-yard of Messrs. Eyton Brothers, at Mostyn, Flintshire. She is entirely owned by Messrs. Eyton; is intended to ply on the Liverpool and Mostyn station; and has been modelled so as to combine capability of stowage with speed. A pair of 45-horse steam-engines, for the *Taliesin*, are now in the course of erection at the Mostyn Foundry. These engines have been recently invented by Messrs. Eyton, being on an entirely new principle, combining extraordinary lightness with power and economy of space. The two engines weigh about 12 tons, have no beams, and only occupy about four feet, longitudinally, of the vessel's hold. They have another advantage in long connecting-rods, and the smallest, possible amount of friction. These engines are equally applicable to steamers of the lightest as of the heaviest class, from a river boat drawing one foot of water to the first-class war steamer.—*Liverpool Albion.*

[We presume that the weight here assigned to the engines is *exclusive* of the boilers; but even with that qualification, it is surprisingly—indeed, we may almost say *incredibly*—small. We shall be glad to receive some farther account of these engines.—Ed. M. M.]

Electro-Magnetic Railway Controller.—A private exhibition of Messrs. Wright and Bain's Patent Electro-Magnetic Railway Train Controller took place on Thursday evening last, at the Royal Polytechnic Institution, Regent-street. The object of this invention is to prevent those dreadful accidents which so often occur under the present system of working railways. These improvements were illustrated by working models, which clearly showed that, in the event of any obstruction on the line, disarrangement of switches, or leaving open of cross-road gates, &c., timely warning would be given to the engineer; and, in the event of his not regarding it, a loud signal would then be given, and the train stopped without his aid, before it reached the point of danger.

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Mechanics' Magazine,

SEUM, REGISTER, JOURNAL, AND GAZETT

965.] SATURDAY, FEBRUARY 5, 1842. [Price 3

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

RIGHT AND BAIN'S ELECTRO-MAGNETIC RAILWAY CONTROLLER

Fig. 1.

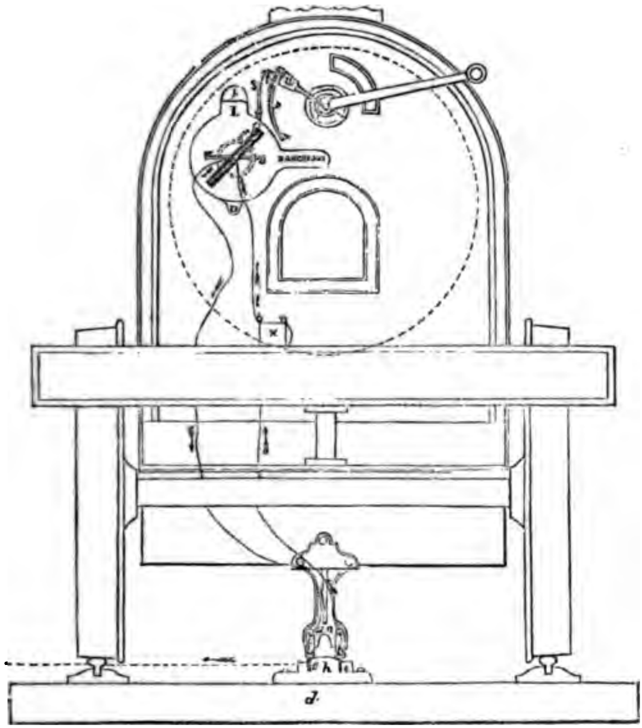
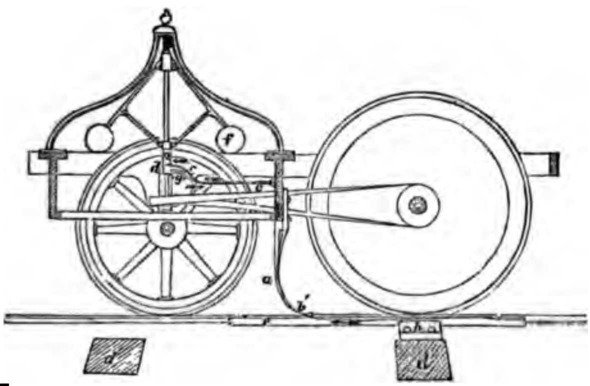


Fig. 2.



WRIGHT AND BAIN'S ELECTRO-MAGNETIC RAILWAY CONTROLLER.

The frequent occurrence of railway accidents, and the awful consequences attendant upon many of them, have directed an immense mass of intelligence to the study of means for giving increased security to railway travelling. Many plans for this purpose have been made the subjects of recent patents, and several of them have been very fully noticed in our pages. Our readers will, doubtless, have been struck with the similarity between several of these plans, as well in their mechanical details as in their principles of action. The plans hitherto published have, for the most part, consisted of various sorts of self-acting signals, by which the presence of danger is communicated in time to enable an engineer to arrest the progress of a train, and thereby avert the threatened danger. For accomplishing this object, various arrangements of solids and of fluids have been employed; but we have now to lay before our readers a more recent invention for establishing railway security, in which the most subtle of all agents is employed, viz., the electro-magnetic fluid.

This apparatus is the joint invention of Messrs. Wright and Bain, the latter of whom is already well known to our readers, and to the world of science, as the inventor of the electro-magnetic printing telegraph, the electro-magnetic clock, &c. It consists in the conveyance of the electric fluid from a battery attached to the locomotive engine, to a pilot engine by which the former is preceded at a distance of about a mile and a half. Should any obstruction in the road stop the pilot engine, or disturb its course, the current of the electric fluid is broken, and ocular notice is immediately given to the engine-driver; should this warning be disregarded, attention will be called by sounding a whistle, gong, or other alarm; and on this being still unheeded, the apparatus will then of itself turn off the steam, apply the breaks, and stop the train, without the interposition of the engine-driver. The invention is described generally as consisting of the application of the electro-magnetic current produced by the voltaic battery, to certain mechanical operations, principally through the temporary magnetism produced in soft iron by induction, or the power exerted by its attractive property as a magnet, and also the deflection of the coil and wire and magnetic needle. The patentees prefer to keep the needle fixed, and to make the coil to deviate, as the latter is not affected by the approximation of masses of metal. The manner in which this is effected will be made intelligible by reference to the engravings on our front page, wherein fig. 1 represents an end view of a locomotive engine, with the indicator attached to the boiler, and Fig. 2 a pilot engine, by which the making and breaking of the current, or electric circuit, is effected.

On the lower part of the fire-box of the locomotive engine, fig. 1, is bolted the leg *a*, to which two springs, *b b*, are screwed. In the centre of the sleeper *d d*, a block of wood, *k*, is pinned, in which are bedded two lengths of hoop-iron, or other suitable metallic connexion, *e e*, on which the springs *b b* slide when the engine is in motion. A side view of the same is shown in fig. 2, which is a section inside one of the rails and frame of the pilot engine, where *a* exhibits the side view of a leg fitted with springs, *b′*, which also constantly press on the metallic conductors *e e*. For the sake of distinctness, we will call these conductors or wires, which lead to and from the battery, positive and negative; the positive wire *l* goes from the battery *x* up to the coil of wire which it forms, then to the electro-magnet situated within the indicator at I, and thence passes down to one of the springs *b*, so that the electric current flows from the battery through the coil of wire around the magnet, while from the spring *b* it flows along one of the hoop stretchers to the spring *b′* of the pilot engine, fig. 2, and thence to the spring *c*, which rests on the moveable stem *d* of the governor *f*. It then returns through the spring *g* (which is similar to the spring *c*, and also rests on the stem *d*) down to one of the springs *b′*, through which it flows to the spring *b*, which is attached to the engine, fig. 1, and thence up to the battery. Thus the electric circuit is formed, the breaking of which gives the signals, &c. as before described; and the following is the way in which the circuit is broken by the occurrence of any impediment

ne of rails:—The pilot engine the locomotive from one to two such a distance as will enable eer to overcome the momen- the train; should any obstacle : pilot engine to stop, the go- ill of course stop also, and the cending will force down the until one of the springs *c*, comes rt *o* of the stem, which is made or any other non-conducting e, thereby instantly breaking the current, which had been trans- s before described, from the bat- ugh the coil of wire and magnet. ult is, that the coil of wire not ny longer under the influence electric current, returns to the al position, and points to the dangerous." A detent is at the ne released when a piece of clock egins to run down, first striking on a bell *k*, or gong, or sounding e, and next, by means of the le- releasing a weight *u*, which shuts steam. The clock work, or ap- by which the signal is sounded, hut off, &c., is so contrived as to id up by the motion of the loco- engine, and is therefore always e; at the same time, by means of imple provision, over-winding is ed.

e event of any obstacle lying on the ie slipping of an embankment, or ment of a rail, by which the pro- the pilot engine is impeded, or l from its proper course, the sig- and ultimate stopping of the train ed with certainty. It is also pro- to connect the conducting wires ie gates at crossings, so that on a eing left open, the pilot engine ort before it reaches it, and there- vents accidents. The intersec- f cross lines of railways are also d, so that on two trains coming he crossing at the same time, the t is foremost stops the approach other until it has passed, and prevents collision.

i respect to the transmission of the current of the voltaic battery, it n proved by experiment, that for nce of five or six miles this may mplished with certainty, and also e conducting power of the wires *ffected by moisture; as it is con- rd that the distance* between the pilot and the locomotive engine need never exceed two miles, it seems probable that this subtle agent may be applied in the manner proposed with every prospect of success.

The action of the models now exhibiting at the Royal Polytechnic Institution is highly satisfactory, and there would seem to be no reason to doubt the equal efficacy of the principle on the larger scale.—B.

HARPER AND JOYCE'S STOVES—MORE VICTIMS!

"For our parts, we would not sleep with one of these stoves in our bedchamber for one night, for ten times the sum we have heard mentioned as having been offered to the patentees for the invention. If the crevices of the windows and doors were sufficiently tight there need be no doubt as to the fate of the sleepers!"

Editorial remarks in *Mech. Mag.*, vol. xxix.

Sir,—The above prediction has just been most awfully realized, and two more human beings have been added to the list of victims.

The patentees of this precious discovery most positively asserted, that it gave out "*neither smell nor noxious vapour;*" the falsehood and fatal tendency of which assertion, I was among the first to point out to public attention. Notwithstanding the numerous cautions given in your pages, the patentees have continued to reiterate their assurances of the "safety and efficiency" of their stoves and fuel, although the dangerous character of these stoves and of the prepared charcoal has been demonstrated by yourself, as well as by M. Gay Lussac, Professor Everitt, and other first-rate chemists.

At an early period in the history of this invention, a gentleman who called at the establishment for the sale of these stoves was informed, "that a person had slept in a *confined apartment*, with one of these stoves burning all night, without experiencing the slightest inconvenience; he was likewise assured, *that if the prepared fuel was used*, not the slightest danger was to be apprehended!"

This is very wonderful—if true; and I can only say, that in my opinion the party had a very narrow escape. However, upon this fact (if fact it be), the patentees have continued to assert the *perfect safety* of these stoves and this

fuel, and one of the consequences of their heartless conduct is set forth in the following extract from the *Weekly Dispatch* of the 23rd ult.:—

"On Saturday morning last, much excitement prevailed in the neighbourhood of Church-street, Hackney, owing to the reported death, by suffocation from charcoal, of two youths in the employ of Mr. J. Long, the confectioner. From inquiries made, it appears that the unfortunate youths, whose names are Frederick Thomas Hersant, aged 19, and William Long, aged 17, were apprentices to Mr. Long. On Friday they complained of the coldness of their bedroom, which was situated over a bakehouse, and for the purpose of airing it, Mr. Long allowed them the use of a *small self-smoke consuming stove*, in which the PATENT CHARCOAL was burnt, with a strict injunction to remove it after the process of airing. This was done; but the poor fellows, anxious to impart warmth to their bedroom, and ignorant of the effect consequent on inhaling during sleep the noxious effluvia emitted from this charcoal, disregarded their employer's orders, and, in his absence, conveyed the stove into the room, and kindled a strong fire. They also, to make doubly sure their work of unpremeditated self-destruction, closed every aperture and crevice in the room, and, after making fast the door, retired to sleep—alas! to wake no more. Surprised at their non-appearance on Saturday morning, Mr. Long knocked at the bedroom door, and eventually, after many fruitless attempts to arouse them, forced his way into the room, and found them, to his surprise and grief, in an apparently lifeless state. Mr. Garrod, surgeon, was promptly in attendance, and pronounced Hersant to have been dead some hours. The other youth, Long, gave faint signs of animation, though little hope was entertained of his recovery. Mr. Garrod and the Messrs. Toulmin, surgeons, were unremitting in their attentions to him, but all that medical skill could devise proved unavailing. The unfortunate youth lingered until twelve o'clock at night (Saturday), when he expired. Monday an inquest was held at the Lion, Hackney, before Mr. Baker, on the bodies, and the above circumstances having been corroborated, a verdict of 'Accidental death' was returned."

The "infernal machine" which was moving to this catastrophe, was a Harper and Joyce's stove of the smallest size, which Mr. Long had purchased at a sale, where, with other rubbish, it had been brought "to the hammer."* The fuel employed, was the "prepared charcoal," purchased only about a fortnight before at Mr. Harper's shop in King William-street, City, and therefore perfectly *fresh* and *genuine*. Fortunately for science, Mr. Long was not in the habit of using any charcoal in his business, nor was there any other than the "prepared" upon his premises.

You pertinently asked (at page 208 of your 29th vol.) "if the death of any party had taken place in consequence of full reliance on the assurances in the prospectus of the 'new stove' as to the innocuous nature of the 'prepared fuel,' would not the patentees have been indictable for manslaughter *at the least?*"

How the jury could conscientiously reconcile their verdict of "accidental death," under the foregoing circumstances, with the evidence submitted to them, I know not—unless it was, that from the manner in which Mr. Long became possessed of the deadly instrument, he did not receive with it any "prospectus" or "directions for use," and could not therefore be said to have been misled by them.

Had there not been an implied reliance, however, upon the *superior safety* of the "prepared charcoal," Mr. Long would scarcely have sent from Hackney to the city for it, when plenty of common charcoal could be had at his own door.

Singularly enough, the very same paper from which the foregoing melancholy narrative is taken, contains in juxta-position to it, an advertisement of Joyce's stoves, in which they are described as such "excellent, useful, and convenient stoves, as no house should be without!" "Excellent"—for suicidal purposes; "useful"—for killing vermin; "convenient"—for disposing of burthensome relatives!

The most remarkable feature of the advertisement, however, is that no allusion whatever is made to the "prepared fuel;" which is fairly thrown overboard, by the following concluding notice:—"Improvements have been made by the addition of pipes or chimneys suitable for offices, shops, warehouses, &c., for the purpose of burning *coke!*"

In this form it ceases to be Joyce's *patent* stove, and becomes an Arnott's stove of the very worst description; the

* By placards posted about town, I perceive that "nearly three hundred" of these stoves are doomed to a similar fate at the Auction Mart on Thursday the 3rd of February, and following day!

as regards economy of fuel and
tion of heat, and also as regards
bility to those accidents for which
nd of stove has obtained an unen-
notoriety.

a, Sir, yours respectfully,

WM. BADDELEY.

on, January 27, 1842.

CHANICAL CHIMNEY SWEEPING.

—It is with considerable reluct-
hat I venture to express an opinion
the communication of Mr. J. A.
e in your last number, on the sub-
f mechanical chimney sweeping—
d, as that paper seems to be, solely
tives of humanity.

the whole tenor of Mr. Emslie's
ks, however, are calculated to ope-
nost prejudicially upon "the good
' which he evidently has at heart,
t beg leave to place the subject in
re correct position before your
rs.

. Emslie sets out by supposing that
sent we are wholly unprovided with
nechanical chimney, sweeping ap-
s of a satisfactory character; he
goes on to enumerate defects (or
sed defects) of the apparatus here-
employed for this purpose, and
suggests some machinery which he
lers adapted to produce the object
w—a clean chimney.

t, that Mr. Emslie names Glass's
ine, I should have supposed him as
nt of its existence, as he evidently
its superior capabilities. The fact
at to this simple, but highly effica-
machine, we may with strict justice
Mr. Emslie's own words, and say,
"*a more simple, safe, and effica-
plan for effecting the object in
it will be difficult to find.*"

the economy of its first cost,* facility
, and universality of application, as
as in the cleanliness and efficiency
operation, it leaves the suggested
of Mr. Emslie immeasurably be-

here is no chimney in existence ca-
of being swept by the *weighted*
, that could not be swept far better,
with less injury, by one of Glass's machines; while there are innumerable chimneys to which the former is wholly inapplicable, that may, nevertheless, be very effectually cleansed by Glass's machine; among the other advantages of which must be enumerated, that of not requiring any previous provisions of pulleys or flue doors, except in the case of flues that are perfectly horizontal and quite beyond the powers of the weighted brush.

The pneumatic chimney-sweeping apparatus of Mr. Emslie is really beneath criticism; and his proposition to insert a damper in the upper part of the chimney, so as to close it in case of fire, is calculated to cause the very injury it is proposed to obviate. This highly mischievous plan is sometimes resorted to, by covering the chimney pot with wet sacks, blankets, &c., and when effectually done invariably produces disastrous results. I have seen elegant rooms with every article of furniture contained therein very seriously damaged in this manner. Stopping the draft of air at the lower part of the flue, and thereby checking combustion, is highly beneficial; but closing the upper orifice and driving all the heated air, smoke, and other products of combustion down into the apartment, is productive of serious mischief.

I am, Sir, yours respectfully,

WM. BADDELEY.

London, January 31, 1842.

* he cost of one of Glass's machines complete, *in length, is only 2l. 13s.; 40 feet 3l. 2s.;* *feet, 3l. 11s.*

PILBROW'S CONDENSING CYLINDER ENGINE—MR. PILBROW IN REPLY TO MR. CHEVERTON, MR. RADLEY, AND N. N. L.

Sir,—With your permission I will make a remark in answer to Mr. Cheverton's letter, (p. 439, in your vol. xxxv.,) which long since should have been done, had I been less engaged.

I think that Mr. Cheverton should not have made me "the occasion," if not "the subject," of that long communication, when he admits, in the first paragraph thereof, that "denies it not," speaking and quoting my remarks. We then both agree; and I must inform Mr. Cheverton, that I have ever given a maximum of my attention and dependance to practice rather than to theoretical deductions; and that when I made those remarks, I merely considered that the *data* for a calculation were the subject of

philosophy, and that if these were sound, the mathematics would not err in its conclusions—of course, meaning, that if the whole of nature's laws, that were brought into action in any particular case, were not considered, or any *made* to act a part that did not do so in practice, that this was a philosopher's error, and one that could not be attached to the mathematician; therefore that the errors, multitudinous as they are that have almost choked our history of science and theory, all originated in the data or false philosophy, and not in the mathematical process. Mr. Cheverton "denies this not;" we both are, then, of the same sentiments, and as there has been enough said about this matter without my assistance, I shall only now thank Mr. Cheverton for his attention to me and mine.

But before closing I would observe, in reference to Mr. Radley's paper, that his opinions and his testimony are a proof of the *correctness* of my theory and calculations, rather than, as Mr. Radley supposes, a contradiction. I did not rest my argument upon the speed of the piston when actually descending, but I pointedly expressed the fact of the *pause*—a pause that the crank engine can never partake the advantages of—a pause of one or two seconds after the eduction valve is opened to permit the steam to pass into the condenser, and be condensed before the steam valve is opened. This I know to be the fact, from accurate observation, and from the written communication of Mr. West, the engineer of Fowey Consols, which is printed in the pamphlet on my engine.

"The cause, nature, and real mode of operation of the pause," in the best Cornish engines, seem to me not to be very lucidly or accurately described by Mr. Radley, for upon the indoor stroke being completed, the equilibrium valve is opened by the termination of the action, and the piston immediately returns; by its approach to the top, the equilibrium valve is shut and the eduction valve opened, then one, two, or more seconds transpire, (according to the quantity of water necessary to be pumped,) before the cataract or time-divider releases the steam valve, and thus permits its opening, when the vacuum is already formed as I have stated. How Mr. Radley can doubt the utility of the pause, or even *suppose it an evil,* I must leave your readers to judge, who so frequently have had the action of these engines laid before them. Mr. Radley should not *theorize* upon the speed of the piston alone, in reference to me and mine, but with it consider the steam's action and nature under the piston in each engine at those points.

I am, Sir,
Yours respectfully,
JAMES PILBROW.

The Green, Tottenham,
January 24, 1842.

P. S.—As I was going to post the above, I saw in your last, (No. 963,) a paper from Mr. Cheverton and N. N. L., which, with your permission, I will briefly notice.

In the passage directly referring to me, Mr. Cheverton uses these sentences: "Mr. Pilbrow's entire faith in it," &c.; "the sanguine, but deceptive expectations," &c.; "not being himself, perhaps, a mathematician;" "*blind indiscriminating admiration,*" &c. &c. &c. These various expressions are certainly not very complimentary to me or my abilities; and as Mr. C. knows, evidently, but little how far such are justly bestowed, he should not be so free in his allusions. Nowhere, I believe, in my papers or writings can be found any thing like "entire faith" in the hyperbolic curve, for I have merely considered that my engine offered the advantages of expanding the steam as low as should be found in practice economical—*not further*—though that was not said to be my object in the invention, but merely named as a minor advantage attending it. As to my "sanguine, but deceptive expectations," Mr. C. should first ascertain how sanguine I am, and next prove, or wait to see, how deceptive my expectations are, before he writes so positively, for in the whole of his voluminous observations, he has not in the slightest degree affected my engine. The next quotation, perhaps, is a matter of opinion or comparison, and therefore not likely to be decided to the satisfaction of all parties, nor usefully to any one, except to myself, who am satisfied upon the matter, for I find I am mathematician enough for all my purposes, which partake of as much practice as theory. As to "blind indiscriminating admiration," I can but feel obliged to Mr. Cheverton for such a compliment to my discretion and discernment, though I did not know that I had, in my late observations upon the subject which gave rise to such discussion, so shown my inability and ignorance.

In answer to N. N. L.'s 1st point, I beg to say that it is so, or we should alter the power of an engine by altering the stroke, though the consumption of the steam and all

ained the same. To the 2nd I would erve, that in the common engine *ernate* stroke has to eject the con-nt, therefore there must be some ity here; but in mine, half that is ejected at the termination stroke, (calling, here, *half* a n a stroke.) As to the injurious ejecting the condensement in so eriod by a large piston, "when the in the worst possible position to the movement of the engine," I y I consider the contrary. Those ainted with the steam-engine, and se regulation, know that it is de-hat all the momentum and elastic the steam, above the amount neces-simply overcome the friction of the should be taken from it before the he stroke, so that it should not be l upon the matter of the machine To accomplish this, it is the practice of the best engines to let in the on the eduction side of the piston, he stroke is quite completed, or in the late eduction valve, and opening rary, prior to the turn of the piston, all to a perfect and positive easy low, such proceedings are accom-with loss of duty and steam; but e engine is properly regulated, the um acquired by the descent or ascent istons, and all the machinery there-nnected, will be taken up by force y for the expulsion of the condense-c., to the atmosphere. This action be a sudden jerk or concussion, as ve supposed, (as I have before fully d,) but a gradual oozing, rather, of densement; when the momentum of er has the greatest power over the instead of the worst; when the ay have to move twelve times as l twelve times the distance of the er piston, which gives, of course, portion of mechanical advantage. If . doubts the accumulation of power, centrated force doing as much as a ed" force, let him think of the stamping machines. As to that part to the better vacuum and the accu-n in the condenser, although N. N. L. reat measure answered himself, and ie the trouble, I shall simply say, en there is a separate condenser, ac-to the proportion the same bears to pump, so will the accumulation of ; for if the air-pump is of the same as the condenser, then must there the time the air-pump makes its double the quantity thrown in by m *cylinder and injection each stroke*, r-*pump could not take out* as much as was thrown in; and when the air-pump is only a single-acting one, this accumula-tion is again doubled. All this I have said over and over again, and nothing but this can be inferred from it; not that I suppose less is taken out than is thrown in. I am obliged, however, to N. N. L. for his notice, and shall be happy to meet him again, if he is not satisfied with my hasty reply.—J. P.

PILBROW'S CONDENSING CYLINDER ENGINE.

Sir,—This invention has been so much discussed in your pages, that I should not join in it, but for my promise some time back, particularly as Mr. Pilbrow has, I think, answered satisfactorily the objec-tions made to its principle. Whether, however, there will be that perfect equi-librium necessary to give it so great a superiority over the present engine, is a point that practice alone can determine, though I do not see any theoretical law to prevent it.

In Mr. Pilbrow's reply to my question, respecting the consumption of fuel by the best marine engines, he has shown the difficulty of determining the quantity with any accuracy, owing to the frequent variation of the actual power by cutting off the steam at different parts of the stroke. I regret I cannot help him to a nicer appreciation; but there are few facts taken with sufficient accuracy to de-termine the real amount; and it is to be lamented that the suggestion of one of your correspondents has not been adopted, and the returns of fuel consumed made in the form of his log. Until this is done, I think no dependence can be placed on bare statements of only 5 lbs. per actual horse power, from whatever quarter they may come; for I have little doubt that this return has been made from the total quantity of coals consumed on a voyage, calculated upon the extreme actual power, worked to the utmost, when the diagrams have been taken, but which extreme has not been continued more than one-fourth the whole distance.

Although I think it will be found, on a proper comparison, that, making allow-ance for the gain in duty by expansion, the engines of the present day consume, on the average, nearly as much coal as the average of Mr. Watt's engines, there is certainly not so great a difference be-

tween the cylinder exhaustion and condenser vacuum of the *best* modern engines as in those of Mr. Watt; and the apparent improvement in modern practice is so great, that it ought to give a corresponding increase of duty, but it does not. Either the results, therefore, of Mr. Watt's engines, given by Mr. Farey, are inaccurately reported, or no reliance can be placed upon the vague and ever-varying assertions of consumption of the present engines. Whatever may be the cylinder exhaustion of the average of engines, the best, using steam expansively as low, nearly, as it can be used, are within three-quarters of a pound of the condenser vacuum; an approximation as near to perfection, probably, as the action of the steam-engine will permit. But I certainly agree with Mr. Pilbrow, that this excellent evacuation is only obtained by an equal loss of steam power, by opening the exhausting valve before the completion of the stroke; so that there is a total loss equal to 1¼ lbs. on the square inch, even in the best engines. Assuming, then, that Mr. Pilbrow's engine will maintain an equilibrium throughout the stroke, there can be no doubt, I think, that it will be superior to the most excellent marine engine that can be made, to the extent of 1¼ lb. the square inch, in this particular, and probably to half a pound more for a better extreme vacuum, giving a total gain of 2 lbs. That such an invention must inevitably supersede the separate condenser engine of Mr. Watt, I see no reason to doubt, and I cannot give the talented inventor higher praise. It certainly has the merit of being the most original, as well as the soundest based improvement on the steam-engine since 1765, amidst the thousand attempts made since then to improve Mr. Watt's. S. has justly observed, that Mr. Pilbrow's engine is contending with a substantial, not a shadowy defect in the present engines; and as it is yet more simple than Mr. Watt's, and cheaper, it seems to me that Mr. Pilbrow may claim the merit of having brought the reciprocating engine to the highest perfection of economy in fuel that its nature is capable of. It seems to me that the condensing cylinder engine is a valuable contribution to mechanical and philosophical science.

To prevent any jar, Mr. Pilbrow will probably find it better in practice to increase the area of his condensing cylinder, (keeping the capacity, of course, the same as the steam cylinder,) as its speed will be double that of the present air-pumps, which might render the discharge of the condensement somewhat inconvenient. This additional speed may prevent the speed of the piston being increased to 400 feet a minute, as Mr. Pilbrow contemplates, to obtain double the power in the same space.

There are now four inventions before the public, of the very highest importance to steam navigation; sound in principle, and, except the first, amply confirmed by practice. The condensing cylinder engine of Mr. Pilbrow; the condensation by injection, to prevent incrustation, of Mr. Symington; the prevention of smoke of Mr. C. W. Williams; and the screw propeller of Mr. Smith. Britain, it is gratifying to see, still maintains her station, the first in the mechanical and useful arts. She has now put at the disposal of commerce new means of extending it, of removing many acknowledged evils of steam navigation, and yet what an amount of prejudice has talent to overcome! People will not believe their sight! Every thing changes—states, cities, empires, nations, the earth and sea—all progressing to some wondrous close; but the human mind remains "cribbed, cabined, and confined," bound up in prejudice, and we see now in operation what so long retarded the introduction of Mr. Watt's engine, three quarters of a century ago. Is it written that the mind alone shall never progress from a bondage that has in all ages debased it!

I am, Sir, your obedient servant,

SCALPEL.

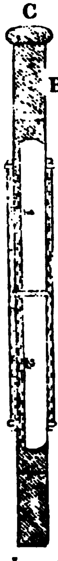
January 29, 1842.

MALLET'S HYDRO-PNEUMATIC BUFFERS —IMPROVEMENT SUGGESTED.

Sir,—It is with some degree of diffidence that I come forward to suggest an improvement in the invention of a practical engineer, like Mr. Mallet; who may be supposed to have well considered the precise bearing and effect of his combinations, and to have adopted the best and most appropriate means, for making his invention practically perfect. I make this observation, preparatory to referring

art of Mr. M.'s ingenious hydro-
atic buffers, described in your No.
which has struck me as far from
ting the adaptation of well devised
to obtain the best results. I allude
means adopted by Mr. M. for pre-
g the plunger being driven out of
linder by the rebound or recoil of
mpressed air, which is done by pro-
; fillets cast on the inner end of the
r, which impinge against the cy-
on the recoil of the plunger. But,
as I am able to understand Mr.
description, his invention contains
vision for preventing or counter-
the sudden shock or concussion
which the inner end of the plunger
thus be driven against the cylinder
: reaction of the compressed air.

very simple expedient offers itself,
ich the plunger may be as effec-
prevented from being driven out
cylinder, as it can by fillets or any
mechanical resistance, while at the
time the possibility of any shock or
ssion is entirely obviated. For this
se it is only necessary to employ a
; hollow plunger, divided into two
parts and working through both
of the cylinder. The following fig.
ccompanying description will render
ore plain.



is the cylinder, truly bored, and *what longer than the double* (and partly) hollow plunger B, which works through both ends of the cylinder in stuffed collars, and is divided into two equal parts 1, 2, by a metallic plate or diaphragm, which projects so as to be capable of being formed by any appropriate means into a piston, working smoothly in the cylinder. One end of the plunger is armed with the usual buffer-head; C, the other end, is plain and concealed in the frame work of the carriage. The apertures of the two air chambers of the plunger, communicating with the cylinder, are near to each side of the piston and in the lowest part of the plunger.

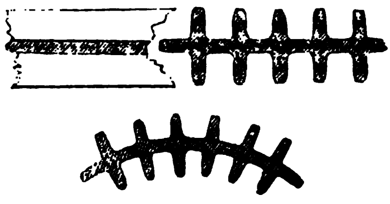
Now it is obvious, that if the air in each division of the plunger be in an equal state of compression, the latter will necessarily be in the position represented in the drawing with the piston exactly in the middle of the cylinder, and the buffer at rest. On coming into collision with another body, the buffer will be driven in, more or less, according to the force of the collision, and the air in the farther chamber (2) of the plunger compressed accordingly. But whatever may have been the force of the collision, and degree of compression, the plunger cannot, on removal of the impulsive force, fly back or rebound with a sudden shock against the end of the cylinder as in Mr. M.'s arrangement: for as soon as the piston passes the middle of the cylinder on its return, the air in the near compartment (1) of the plunger begins in similar manner to undergo an increasing compression, which will not only destroy the force of the recoil, before the piston comes near the end of the cylinder, but re-act on the opposite end, in its turn; thus establishing an oscillating motion of the two ends of the plunger, until the buffer finally comes to rest, with the piston in its old position in the middle of the cylinder.

As a concluding suggestion, let me ask whether oil would not be a better fluid for using in the cylinder than water? Oil would lubricate and make the different parts of the buffing apparatus work with greater ease and delicacy of movement; and the freezing point of certain oils is considerably lower than that of water. The quantity required for each buffer would be trifling.

N. N. L.

January, 1842.

MR. C. W. WILLIAM'S IMPROVED BOILERS —IMPROVEMENT SUGGESTED.



Sir,—Will you permit me to recommend, through the medium of your journal, the adoption of ribbed plates, as represented in the above sketches, in lieu of Mr. C. W. Williams's cylindrical conductors, one portion of which that gentleman admits there is a difficulty in introducing, on account of their interfering with the removal of deposited matter. These ribbed plates would admit of a great extent of heating surface, and would offer no greater obstacles to a cleansing process than common ones.

I am, Sir, your obedient servant,

C. W.

PROTECTION OF THATCHED COTTAGES FROM FIRE—ARCHIMEDEAN SCREW PROPELLERS—THE BUDE LIGHT, &c.

Sir,—In my letter of last week, on the prevention of fires, I forgot to mention an effective means of rendering the thatch of cottages, barns, &c., incombustible. It consists in soaking the thatch with whitewash made of lime, or whitening and size, in the usual way, to every four gallons of which is added one pound, or rather more, of alum. Alum would suffice by itself, but the rain would wash it off. The lime and size form a film over every straw, insoluble in water. In July, 1835, I covered a quantity of straw and perfectly dry furze with this cheap preservation, and, after it was well dried in the sun, I endeavoured in vain to make it burn. I do not pretend that this wash can, with expediency, be applied to the *vertical sides* of a *hay-stack*, because, first, it would not penetrate sufficiently; secondly, the quadrupeds would not like it. Whether the wash would be best applied to the straw before being bound into a thatch, or afterwards, a trial or two would determine. If deal boards are well soaked in a strong solution of alum, I should not like to have the task of setting them on fire with the [illegible] *roche à feu*, (in English, wild-fire, or carcass composition,) even my own, which Woolwich authorities have told me is stronger than Congreve's; it burns a hole through an iron plate, and consumes an iron bolt, a quarter of an inch diameter, in a few minutes.

Whilst I have my pen in my hand, I will take the liberty to touch upon another trifling thing or two, until I have time and means to give you something better, which will be soon.

"I hope I don't intrude," if I venture to say a word or two about the *Archimedean* screw propeller for steam-vessels. In your Number 961 there is a long account of "A Trip in the Archimedes" steam-ship. Now, although I have already mentioned the fact, I do not think it impertinent for me to take the liberty of repeating it, *i. e.* that it was I who presented the plan, with models and drawings of this said screw propeller, to the Duke of Clarence, Lord High Admiral, in 1837. Admiral Sir Edward Owen was then his secretary, or chief counsellor; I have his letters to show that my plan was rejected as inefficient! Many other things, which on occasion of the first war will surprise the belligerents, were also disregarded. So much for that.

Another item is, that I see a patent taken out for a light caused by the projection of a jet of hydro-oxygen gas on to a cylinder of lime. It was Mr. Goldsworthy Gurney who invented that mode of producing an intense light, at his residence of Bude, in Cornwall, in the year 1825—at least, that was the year in which I first saw it. This light afterwards got the name of the "Drummond Light"—how, I do not know: but Lieutenant Drummond was a gentleman well connected, and belonging to the British service!

The season and the weather prompt me to write a word on humidity. In 1816, I lived for some time near Tonbridge-wells, in Kent. In very dry summer weather, I observed patches of grass quite green, while others were brown—dried up by the sun. I thought it right to examine the cause, and, by a few strokes of a spade, I found that there was a stratum of chalk in contact with the roots of the grass. This guided m-

eral reflections. I thought that had a greater disposition to attract etain the moisture of the atmo- than other earths, and I have still to be of that opinion. I also ob- that the large earth-worms, (lom- never came up to defile the turf it was upon a layer of chalk. So st application of my remarks was suade my friends Mr. Campfield, aint, Mr. Woodgate, the banker, ome others, who had their wives' aughters' shoes daily soiled by the s' projections on their lawns, to me to take up the turf, and replace er putting under it a thin stratum lk, broken about as fine as the coal n smiths' forges: but the finer the . I did all this in June, 1816, and worm ever came up afterwards; s that the turf always retained its re, in the driest weather. Some after, I observed on my garden , during a frost, especially when ned with fog, a circumstance which some way to confirm me in my at the humidity-attractive disposi- f chalk. I observed that a piece of , exposed to the frost, accumulated d it more than five times its own t of ice, and after a few frosty foggy , the bit of chalk became as a speck centre of the surrounding ice. frequently remarking this fact, I ught me of trying whether other nces would become equally covered ce, under similar circumstances. I l in propinquity, on the same path garden, bits of wood, orange-peel, marble, iron, lead, and glass, all of ame sizes and shapes. I have not access to my memoranda on this t; but, as far as I can remember, ron and lead accumulated no ice; rk scarcely any; the orange-peel a the marble rather more; the wood,) a little; but the chalk, after a few and nights' exposure, was surrounded least six times its own weight of ice. e this experiment in the hands of sophers to try at a cheap rate.

w we must teach the ladies to skait, ut the possibility of a fall whilst ing. In 1816, I had constructed bell-shaped things of wicker-work, fitting round the chest, under the but expanding at the bottom to four feet diameter—it might be *Shoulder-straps prevent its touching* the ice; but upon a trip which, *sans* the basket go-cart, would have been a fall, the machine, (if we may so call it,) rests and slides upon the ice, supporting the lady under the arms on a well-padded rim. This is no joke, for I put it to a successful test at Groombridge, in Kent, in 1816. However, I do not suppose that the ladies will avail themselves of the suggestion.

I hope that my next letter will contain something better than the trivialities of this. By the by, Sir, do you know—I dare say you do—the origin of the word "*trivial?*" The ancient Roman roads were formed of a carriage-way, and a foot-path on each side, as are most of ours; hence they were called *tri viæ*, or three ways. But the word "trivial" used to mean, with the ancient Romans, any thing well known, and common, and spoken of on the high roads, or *tri viæ*. The triumphal arch at Hyde-park-corner sins sadly in having only one centre passage for carriages, which formation makes it look very heavy. All Roman triumphal arches have three openings—*tri viæ*.

I have the honour to be, Sir,

Your obedient

F. Maceroni.

January 20, 1842.

GREAT REDUCTION IN COST OF COPPER COILS FOR ELECTRICAL MACHINES.

Sir,—Being anxious to try some experiments on voltaic electricity, and to construct a large coil machine, but, for want of pecuniary means, unable to procure the requisite quantity of "insulated copper wire," it occurred to me that fine tow might be so thrown on as to answer the intended purpose. I immediately applied to Mr. Dinmore, rope manufacturer, at Woolwich, and suggested the possibility of effecting my object by stretching the wire from the wheel, and giving it a rotary motion, while it was fed sideways by a person walking: the experiment was tried, and found to answer admirably. Thus, by this means, an immense length of wire can be covered at a most insignificant cost. To render it more compact and secure, I give it a coat of some resinous varnish after each coil on the reel. When a secondary wire is required, you have only to throw them together by the ordinary method of spinning twine.

By reference to the undersigned, any quantity of this wire can be procured.

J. Walker.

Woolwich, January 11, 1842.

THE MUSOTON.

Cases are sometimes met with, in which, from the improper use of acoustic instruments, or from a sudden and very loud noise, the *membrana tympani* is rendered concavo-convex in an improper sense. To remedy this, Mr. John Harrison Curtis, the surgeon to the Royal Dispensary for Diseases of the Ear, has constructed an instrument consisting of a bag of caoutchouc, with a large ivory bowl attached to it and pierced in its centre, with an aperture communicating with the interior of the caoutchouc bag, to which he has given the name of *the Musoton*. By emptying the bag of air, and then applying the bowl over the ear, such a force is exerted by it on the air being again introduced, that the membrane is drawn out and restored to its natural condition. The bowl (see prefixed engraving) is connected to the caoutchouc bag by a long ivory nipple on its upper surface, on which the caoutchouc is securely fastened. When applied over the ear it is perfectly air-tight, the ivory bowl being cut expressly to the shape of the parts circumjacent to the auricle. The instrument is also very efficient in dry cupping, and from its simplicity it is likely to prove very useful and convenient.

THE BUDE LIGHT.

Sir,—It appears probable that the Bude-light will come into considerable use for purposes of general illumination, and probably in many places where the gasometers and apparatus necessary for generating the gas may be inconvenient. To obviate this, the old Portable Gas Company should look out their apparatus, as it seems to me a fair opportunity offers itself for them to make some use of what failed when coal gas was employed, owing to the partial decomposition of the gas, an effect which would not take place in the case of oxygen, as it did with carburetted hydrogen. If you think the preceding hint for the use of portable vessels of oxygen gas likely to interest your readers, I shall feel gratified by its insertion.

I remain, Sir, your obedient servant,

E. M. I.

London, November 1, 1841.

CEMENT FOR SILK.

Sir, — Having from its commencement been a reader of your valuable publication, I trust to my no small profit as regards scientific research,—I shall feel greatly obliged if, through your numerous readers, I could learn whether there exists any kind of cement for silk, in pieces? I have gone through your work, and can discover nothing, beyond some propositions for forming an Indian-rubber menstruum for a purpose analogous, but the plan seems imperfect. I once met with an aëronaut who informed me that he had such a preparation, and could, moreover, encase his balloon therewith, so as to prevent the escape of the gas; at all events, I should be glad to know if such an article, as regards the adhesive principle, can be purchased, and where?

I remain, Sir,

A Constant Reader.

November 16, 1841.

CASTING OF SPECULA.

Sir,—In No. 697, (December, 1836,) of the *Mechanics' Magazine*, your ingenious correspondent, Mr. Lassell, gave your readers a very masterly essay on the casting of specula. I have long been expecting Mr. Lassell would extend his essay to the art of

and *polishing*, which is by far the ficult branch of art. If he would he readers of your work with the art of the process, I do not hesitate rt, that the *Mechanics' Magazine* e in possession of the very best me- f casting, grinding, polishing, and ; specula for reflecting telescopes, appeared in print.

iain, Sir, your obedient servant,

ROBERT JONES.

le, January 19, 1842.

—Perhaps Mr. Lassell would favour a description of his "Observatory" rected at Starfield, near Liverpool.

IPORTANT PATENT LAW CASE.

Crane v. *Price and others.*

case, of the greatest importance to all es, as well as to the particular parties, the iron trade in general, occupied the n of the Court of Common Pleas three days of last week. The plaintiff's dated 28th September, 1836, was for rovement in the manufacture of iron, : specification claimed as the inven- the application of anthracite, or stone- mbined with a hot air blast, in the g or manufacture of iron from iron- nine, or ore."

e trial, before the Lord Chief Justice the verdict was found for the plaintiff, to a special case.

Sergeant Bompas and Mr. Rotch for endants.—There has been no infringe- f the plaintiff's patent. The defend- mit that they have used anthracite with common coal, but what the f's specification claims is, the use of ite alone. To constitute an infringe- f the plaintiff's patent, the anthracite e used either alone, or with such a dmixture of ordinary coal as would ely a colourable evasion. The mere anthracite is not new. In some f the coal fields, the anthracite is so up with common coal, that the use of ortion of it along with the other coal iot be avoided; and that some use has ade of it appears from the specifica- f several patents. As, for instance, rtin's patent, June 23, 1804; of 's patent, August 28, 1824; of Phi- lor's patent, February 28, 1826; of l's patent, April 2, 1828. The an- could only be used under peculiar stances; it could not be used at all ual advantage; but some use of it e made. Now, the defendants have thracite with coke, in the proportion *it 5 cwt. of the former to about 9 the latter. It is impossible to call se of anthracite an infringement of* Mr. Crane's patent, which is for making iron with anthracite as the sole fuel. The defendants have never used anthracite alone, and it cannot be said that the use of it mixed with coke in such a proportion is a mere colourable evasion. The plaintiff is in this dilemma. If his patent is for the use of stone-coal alone, without any admixture of other fuel, then the defendants have not infringed it; if, on the other hand, it is for the use of stone-coal in general, whether alone or mixed, then it is void for want of novelty.

Next come two questions, which though technically distinct, do in fact involve each other—is the plaintiff the first inventor? and is the subject-matter of his patent a new manufacture within the statute? Mr. Neilson had already a patent for the hot-blast, which had been extensively used under license from him; and except by him, or under license from him, there is no evidence of any hot-blast whatever having been used in the kingdom. The plaintiff had himself taken out a license from Mr. Neilson. How, then, does the plaintiff's case stand? Mr. Neilson, by his specification, tells all the world, the plaintiff among the rest, that this hot-blast is an invention of the greatest importance for the smelting of iron. The plaintiff tries it with anthracite, and it succeeds; and then he says, "This is my invention—I will have a patent for it." But Mr. Neilson's patent is not for the use of the hot-blast with bituminous coal, or with any other particular sort of coal; it is for the use of it to blast furnaces, all furnaces whatsoever. Here is no new manufacture, no experiment was tried, no expense gone to; Mr. Crane takes out a license to use Mr. Neilson's hot-blast, tries it with anthracite, finds, as Mr. Neilson had told him in his specification, that it would succeed, and takes out his patent. There is no pretence for saying that Mr. Crane is an inventor, or that this is a new manufacture. Here is a known material, used in a known manner, for a known purpose, the manufacture of iron. All the world knew that the hot-blast could be used for the manufacture of iron; that anthracite could be used for the same purpose, though not so advantageously by itself. There cannot, then, be a patent for using a thing, for the same purpose, in a way which every one knows. All that the plaintiff has done was in the mere ordinary course of using Neilson's hot-blast; he has only followed up that which Mr. Neilson, by his specification, had told him was useful, and he has done nothing else whatever.

Next, the nature of the invention is not sufficiently described in the specification; for anthracite cannot be used with any real advantage in the ordinary large furnaces, and therefore to make that specification

good, it should give some explanation with respect to the sort of furnace required. It is not denied that anthracite may be used both in large and small furnaces; but as it can be used more advantageously in small than in large furnaces, the plaintiff ought to have pointed that out in his specification. The plaintiff's patent is also void as an infringement upon Neilson's, by reason of the express proviso in the patent, that it shall not interfere with any previous patent. The plaintiff's patent is an interfering with the patent of Neilson, which was for the use of hot air generally, in all furnaces whatsoever.

The Attorney-General, Mr. Vaughan Richards, Mr. Montague Smith, and Mr. Webster, for the plaintiff.—With respect to the question of infringement, it is uncertain, on the evidence, whether the defendants were not using all anthracite; but supposing it not to have been so, the use of $\frac{8}{14}$ths of that fuel in the manufacture of iron, in combination with the hot-blast, is a piracy of the plaintiff's invention. Would the defendants have used anthracite at all, had they not been taught to do so by the plaintiff's specification; did any person so use it? Was it known as a fuel to be beneficially employed in the manufacture of iron? The evidence shows that the best iron is made by the use of all anthracite; the defendants are contented with part of the advantage, in hopes of evading the plaintiff's patent right. The plaintiff has discovered a new fuel for a particular purpose; the use of any substantial quantity of that fuel is an infringement of his right. The plaintiff's claim is generally to the use of anthracite beneficially for the purpose of smelting iron, and the specification describes the manner in which it is to be so used. As to the novelty of this invention, the specifications of former patents go a long way to prove the plaintiff's case. It was a great desideratum to be able to use this anthracite; numerous attempts were made, patents were taken out for supposed methods of using it, but they all failed. The use of anthracite at Abercrave was a signal failure; iron was made by the use of anthracite, but it was at a loss of from 2*l.* to 4*l.* per ton; and the iron made was so bad, tender, and short, that it was got rid of with the greatest difficulty, the attempt soon abandoned, and the furnace given up. There is no single instance, before the plaintiff's patent, of anthracite ever having been used beneficially. If so, how came its use to be abandoned, or the discovery of the method of using it so great a desideratum. The material existed in abundance, but nothing was done with it; the instant that Crane's patent becomes known, the value of the whole anthracite district is increased beyond estimate.

As to the result of the process,—The quantity of fuel used is less, the yield of the furnace is greater. The iron produced is superior in quality. It is a new species of iron, such as has never before been produced in this country, or in any other, from coal, more nearly resembling the iron from vegetable charcoal than any other. Its superiority to ordinary iron is proved by the evidence of several witnesses, both as respects the uses to which it is applicable, as chain-cables, and the comparative strength of this and ordinary iron. Thus a better and a cheaper iron, and in fact a new article of commerce, has been produced. But it is said that there is not a sufficient amount of invention. How otherwise is the amount of invention to be measured than by the magnitude of the result? The test is not so much the amount of merit in the inventor as the amount of benefit from the invention. What merit is there in the mere receiver of a communication from abroad? And yet he is entitled to a patent. Some most important inventions have been the result of mere accident. The omission of the mandril, in Russell's patent, was the device of an idle workman to save himself trouble. The method of making water tabbies was discovered by the accident of a man's spitting on the floor. But, in fact, it did require thought and consideration to judge what the result of the application of the hot-blast to anthracite would be. It was necessary to consider what the effect of the hot-blast would be on the anthracite; what sort of iron would be the result. The proper degree of heat was to be considered; the proper proportion of coal and ore; the proper size of the pieces of anthracite; all of which are described in the specification. It is important to remark that the iron made with hot-blast and common coal is inferior to that made with cold-blast, while that made with hot-blast and anthracite is superior. Does Mr. Crane prevent any one from doing what he did before? There is, then, novelty in his invention. The objection is, that this is not a *new manufacture* within the statute. The cases which interpret those words show, that any material modification of the manner of making a merchantable commodity, producing an improvement in it, is a new manufacture, even if all the substances used were known and used before, provided they were not *so used*. In Daniel's patent, the method of shearing cloth from end to end with a rotary cutter was known; the method of shearing it from list to list with shears was known; a patent for shearing from list to list, with the same rotary cutter, previously used for shearing from end to end, was sustained. In the case of Hall's patent, the use of gas to pro-

ame was known; the flame of oil used to singe off the fibres from lace, ent for the application of the flame that purpose was sustained. In s patent, which was for the appli- charcoal as a filter for sugar, there ing new in the method of using the as a filter, or in the sugar produced; ugh this was litigated on other the question of its not being a ibject of a patent was never raised. al questions in respect of Neilson's re, Is the plaintiff's hot-blast the Neilson's? The fact of his having t a license is not conclusive; for he ke a license and not use it. Did contemplate the use of anthracite as Could his apparatus produce the ure of 600° Fahr.? Could Neilson, his own specification, have smelted h anthracite? It was said in the rossley's patent that the terms of a must be taken with reference to the knowledge at the time. Neither nor any one for eight years after t, appears to have contemplated the thracite as a fuel for smelting iron ces. The proviso in the patent eans that, if a patent be granted nprovement on a subsisting patent, d patentee must either wait for the n of the first patent, or get a license . No real objection can be made ufficiency of the specification. It hat the kind of furnace best cal- or the purpose is not described. nary furnace, which can be, and is he purpose, is referred to. It would n impossible at once to describe the urnace; it would have required the e of a life to arrive at the know- it; but the plaintiff has described it g to the best of his knowledge at the d the invention can be and is worked g to the specification. There is, then, objection, either in law or fact, to ntiff's right; no one is prejudiced; is greatly benefited by the extension rinciple; the public and the nation are benefited by the introduction of w articles of commerce, or by ob- iron of better quality, and at less e plaintiff has been at all the costs ges of the introduction of this new ture into the realm, and is entitled he benefit which will accrue from nent of the Court in his favour.

Court took time to consider their t.

ILLIAMS AND MR. ARMSTRONG.

In my letter inserted in the last on Mr. Armstrong's New Theory of Diffusion, I perceive there is an error in the column, page 88, where it is stated that Mr. Armstrong "wrote to my agent, stating, among other things, as follows," &c. This, I am informed, was not the fact—Mr. Armstrong having consented to the paper written by the solicitor, and a day and hour having been named, (more than once, I believe,) for the signing, after much alteration, and amendment; but which, for reasons which will appear hereafter, he avoided.

I am, Sir, yours, &c.,

C. W. WILLIAMS.

Liverpool, Jan. 31, 1842.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM THOMAS BERGER, OF UPPER HOMERTON, GENTLEMAN, *for improvements in the Manufacture of starch.* Enrolment Office, Dec. 23, 1841.

These improvements relate to a new method of manufacturing starch from rice,—in the first place, by the application of an alkali,—secondly, by the means of fermentation,—and, thirdly, by a combination of both the foregoing: and also to a new mode of bluing starch.

In the first process for making starch, 112 lbs. of rice are soaked for two days in water, which is then drawn off, and the rice reduced to a cream, or pulp. A solution of 7 lbs. of carbonate of soda in 3½ gallons of water, is then added to the rice pulp, and the mixture stirred every four hours for fifty or sixty hours. After standing twelve or eighteen hours longer, the top liquor which contains the gluten is drawn off, and a second dose of carbonate of soda administered, and the stirring and standing repeated, after which the gluten is removed and the starch finished off in the usual manner.

In the second process, any given quantity of rice is placed in a suitable vessel and covered to the height of 6 or 9 inches with water for fourteen days; the water is then drawn off and the rice spread 6 or 9 inches deep on a clean wooden floor or racks, and frequently turned to prevent heating: when soft, the rice is levigated and finished off in the usual manner. In lieu of the foregoing, which the patentee terms the malting process, he states that he sometimes obtains the requisite fermentation and decomposition of the gluten by soaking the rice in water for five or six weeks. If the colour of the starch thus produced is not good enough, it is heightened by means of a chloride of lime or of soda.

The third process consists of a combination of the foregoing, by treating the fermented pulpy rice with an alkaline salt.

The process of bluing starch, is effected

by the use of artificial ultramarine, taking care, that if any free acid remains in the starch, to neutrulize it by an alkali.

The claim is—1. To the above mode of manufacturing starch from rice, by the application of an alkaline salt, whereby the gluten and starch of rice may be separated, as above described.

2. To the mode of manufacturing starch from rice, by submitting grains of rice to soaking in water and fermenting processes.

3. To the mode of manufacturing starch from rice, by the combined application of an alkaline salt, and a process of fermentation.

4. To the mode of colouring starch by the application of artificial ultramarine.

WILLIAM KNIGHT, OF DURHAM-STREET, STRAND, GENTLEMAN, *for the invention of an Indicator for registering the number of passengers using an omnibus or other vehicles.* Enrolment Office, Dec. 28, 1841.

This invention consists of a counting or registering apparatus, contained in a box or case affixed to the side of the vehicle, which apparatus is acted upon by the axle of a revolving shaft, placed across the upper part of the door way or entrance to the vehicle. Through this shaft are placed two pairs of arms or levers, sliding at right angles to each other, one pair lying horizontally under the roof, while the second pair hang down against the door, and are moved by each passenger that enters the vehicle: thereby causing the ratchet wheel to be moved one tooth, which numbers one on the units cylinder.

The claim is to the combination of a counting apparatus, with an apparatus for causing the said counting apparatus to register the number of passengers travelling in an omnibus or other vehicle; such last mentioned apparatus being a revolving shaft, placed across the upper part or roof of the vehicle near the door way; such shaft having two pairs of arms or levers sliding through at right angles to each other, and when at rest, one of the pairs of arms lying horizontally under the roof, while the other pair hangs down against the door way, to form an obstruction which must be moved out of the way by the passenger on entering and leaving the vehicle.

JOHN VENABLES, OF BURSLEM, STAFFORDSHIRE, EARTHENWARE MANUFACTURER, AND JOHN TUNNICLIFF, OF THE SAME PLACE, BRICKLAYER, *for a new and improved method of building and constructing vens Oused by potters and china manufacturers in the firing of their wares.* Enrolment Office, January 18, 1842.

The patentees state, that the furnaces ordinarily employed by potters consume an extravagant quantity of fuel, relatively to the quantity of ware which they contain; and the object of the present improvement is, to subject an increased quantity of goods to the action of the fire at one and the same time, and thereby economise the fuel. For this purpose, a cylindrical oven is formed, with a dome-shaped top, with a series of fire-places disposed around it, of a size and number proportioned to the magnitude of the oven. The heat is led into the interior of the oven by suitable flues, and a ledge or shelf is carried round the inner wall, upon which a circular stack or tier of *saggars*, (earthen frames for containing the wares to be fired, called by the workmen *bungs*,) while other tiers of the same are disposed about the floor in the ordinary way. In another form of oven, the ledges are not employed, but the flues are so disposed as to admit the heat between the several circles of the saggars. The ovens thus constructed are equally applicable either to the biscuit-baking, or to the gloss, or glazing process.

The claim is to the construction of ovens with one or more ledge or ledges, as shown, and also of ovens without a ledge or shelf, but with flues or vents either raised above the floor of the oven, or not at all raised, but with simple openings in the floor; whereby the patentees are enabled, in each of such several modes, to place one or more circles of saggars behind the flues or vents, and thereby to enlarge the capacity of the oven for the process of firing, without the expenditure of any extra quantity of coal or other fuel.

NOTES AND NOTICES.

Patent Iron Mason.—A machine under this name, (for which a patent has just been taken out,) is about to be erected in one of Mr. Nelson's quarries, at Woodside, Glasgow. The stones go into the machine rough as they come from the quarrymen's pick, and come out polished ashlar on the surface, and cut parallel and square on the sides, fully prepared for the builder, and this at an expense of not more than a fourth of work done by hand. The present machine is calculated to do the work of 50 men, reckoning only six hours' work out of every ten. The machine has been constructed by Messrs. P. W. M'Onie and Co., engineers, Scotland-street, Tradeston, the design and arrangements being the work of Mr. P. M'Onie, of that firm. We understand the machine, with the experimenting and patents, has cost 1,000*l*., although new machines of the same size can now be made for one-third of that sum, and smaller ones proportionably cheaper. —*Glasgow Practical Mechanic.*

The Hannibal.—The keel of a 90-gun ship, to be thus named, has been laid on the stocks from which the *Trafalgar* was launched, in Woolwich Dockyard, and a number of workmen are actively engaged in preparing the materials necessary for her construction. The Hannibal will be a splendid vessel, on Sir William Symond's plan, and have a great breadth of beam, for which all the vessels designed by the present Surveyor of the navy are distinguished. The dimensions of the Hannibal are to be as follows:—

	ft.	in.
Length on gun-deck	204	0
Breadth, extreme	60	0
——— for tonnage	39	2
——— moulded	38	4
Depth in hold	23	8

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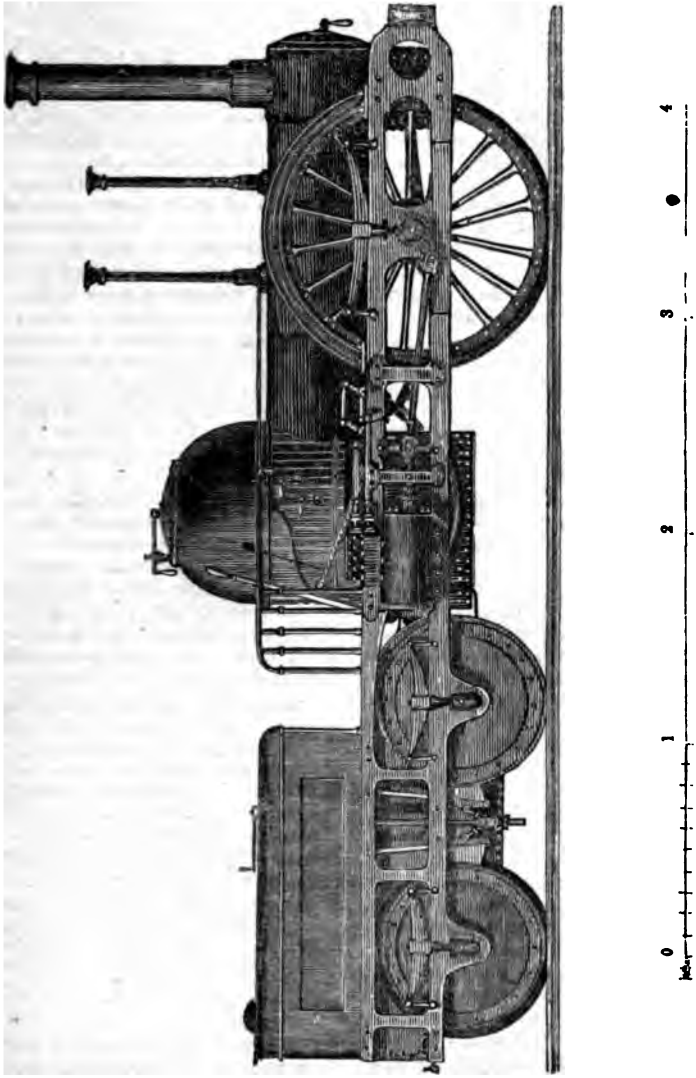

BELGIAN LOCOMOTIVE ENGINE.

[Translated from the *Bulletin du Musée de l'Industrie** of Brussels, for the *Mechanics' Magazine*.]

When one advance has been made in any department of art, others are sure to follow fast; the human mind is ever on the alert, to improve and perfect its acquisitions. M. Arago shrewdly predicted, some years ago, that it would be long before we should hear the last of railways. He was not mistaken in this, though certainly he did very wrong to make use of that as an argument for postponing the extension of the railway system in France; to act so, was to convert progress itself into an obstacle to progress.

Several journals have already noticed the new locomotive of M. Deridder, called, from its economical properties, "The Economy;" and, if we mistake not, this invention is destined to mark a new era in the history of railways.

Already many experiments have been made with this locomotive, on the railway from Brussels to Tubise. On the 13th of July, 1841, it drew, on inclines of 1 in 250, 1 in 333, and 1 in 500, between these two localities, six wagons, carrying 7 tons 8 cwt. of goods and 15 passengers, making altogether a load of about 9 tons 9 cwt. The journey of 48 miles 12 furlongs, (going and returning,) was performed in 80 minutes, and the consumption of coke was only 2 cwt. 1 qr., or 32 lbs. per league of 3 miles 34 poles.

This machine bears to ordinary locomotives about the same proportion as the horse to the elephant; and, like the light but powerful courser, it is guided and controlled at pleasure.

Each driving-wheel has but the weight of one ton to support, instead of three, as in the case of the ordinary locomotive. The engineer has three different degrees of power instantaneously at command, to be used according to the inclination of the rails and the load; he may work either with half steam on, or full steam, or at any intermediate degree of pressure. The same carriage frame includes both engine and tender, which obviates the necessity of having flexible tubes to convey the water to the boiler. The cylinder, and all the rest of the machinery, are under the eye and hand of the engine-driver. The whole of the details, in short, of this machine bear the stamp of difficulty overcome, for almost every separate piece exhibits some improvement. The danger attending an undue elevation of the passenger carriages has been avoided, by placing the seats on a level with the wheels; the wheels themselves are so constructed, as not to be liable either to shrink or break from changes of temperature; and a much improved system of springing has been adopted in the buffers.

M. Deridder's engine, (from its combination of great power with extreme lightness,) renders it now practicable to have railways of almost any gradients. Railway making will, in fact, become reduced to a matter of mere surface levelling, which will allow of a vast saving in the purchase of land, in embankments, masonry, the length and thickness of sleepers, &c. The rails, too, may be reduced in weight, from 50 lbs. per yard to 25 lbs.; and, by an improved mode of construction, chairs may be entirely dispensed with.

We have only to add, that the justly celebrated English engineer, Mr. Robert Stephenson, who was present with several Belgian engineers at the trial before mentioned of the 13th of July last, fully recognizing all the advantages of this new system, addressed a few days after a letter to M. Deridder in the following terms:—

"Sir,—Since I had the pleasure of being present at the experiment with your locomotive and its train of carriages, I have maturely considered the reasons on which your new railway system is founded, and of the effect which it would have in diminishing the capital necessary for railway undertakings, and thus placing them within the reach of districts of comparatively limited traffic.

"I participate entirely in your ideas as to the principal details of this new mode of execution; it is not to be doubted, that from the moment its advantages begin to be fully appreciated, public opinion will force on its universal adoption.

"This system seems destined to unite with the great lines of communication, numerous seats of business of secondary importance, which, though commercial and populous, could not make an adequate return on such

---

* A new quarterly journal, of excellent promise, to which we wish every possible success.—Ed. M. M.

ls as are indispensably required iation of railways on the present

railways which have been under- larger scale than there was com- fic to justify, would, nevertheless, rell, had your system, to which I ly favourable, been adopted.

r remains for me to add, that the a of your locomotive and your s given me much satisfaction; tion of the mechanism is distin- · more than ordinary ingenuity; e no doubt, that the application have made of the plan of working ansively, will be attended with a bout 40 per cent. in the consump- l.

I am, &c.

ROBERT STEPHENSON.

receding article is accompanied graved elevation of the "Eco- which we have copied on a re- ile on our front page, but no lanatory engravings or details are that after all that has been said worthy brother Editor of the and our esteemed countryman ert Stephenson,—the reader is to guess, if he can, and to at all events, what the new im- its are, by which M. Deridder 'ar outstripped (as alleged) all r locomotive builders. It is of htness certainly, this Belgian out light engines, capable only of orrespondingly light weights (as be the case with the "Economy") rangers to English railway prac- Ve have no desire to disparage dder's achievements, but must further information, before we cribe to all that is here said in our. ED. M. M.]

REVENTION—WOOD RENDERED FIRE PROOF.

Having read in your 963rd Num- observations and arguments of deley and Colonel Macerone on ets of fire extinguishing and fire on, I must beg of you to insert ournal my approval of the utility constantly provided with means be put into immediate use; and articularly assent to the valuable f the Colonel, "that prevention than cure;" *yet considering that* *ossession of the knowledge re*quisite to protect wood from fire, and to thwart in a great measure the destructive progress of the "devouring element" at one hundreth part the expense attendant on the Colonel's plan, I must entirely dissent from the adoption of that plan. I know a cotton factory, whose eight floors, containing each 600 square feet of wooden surface, have been as effectually fire-proofed, at an expense of 2*s*. 6*d*. each floor, as though they were metal, and have several times resisted the action of fire, as completely as though they were wetted with water. Now, Sir, the capability to do this surely deserves at- tention, and the object of this letter is to bring the same under the notice of some capitalist, who may be willing to secure an interest by patent in so valuable a discovery. In the above instance of pro- tection 4,800 square feet of deal were made to resist fire at an expense of 20*s*., and so complete is the effect of this re- medy, that wood so treated *will not burn with flame*, nor will its carbon *ignite* like other carbon; and if air be blown upon wood so prepared, and thrust into a fire at bright red heat, it is *kept cool* and *prevented from burning*. Nobody will, I think, attempt to deny, that the prin- cipal sources of fuel in "fires" generally are the floors, and therefore, if these are once protected from kindling, all chance of a destructive fire will be avoided.

The process is so simple and so easy of application, that it can be applied to wooden fittings after erection in one day, provided they are free from paint, and if we may reason from analogy, wood so prepared, can never undergo the action of dry rot. After simply inviting such of your readers as are able and willing to spend a little money in a project which must certainly be lucrative, and stating that I shall be happy to convince any honourable individual so disposed of the tangibility of this process, I shall con- clude, with soliciting your instrumenta- lity in aid of this object.

I am, Sir,

Your obedient servant,

W. R.

Southwark, January 31, 1842.

[Another correspondent (W. M. S.) who writes from Staffordshire, professes also to have discovered *a very harmless and cheap ingredient* for rendering tim- ber, linen, cotton, paper, &c. fire-proof. A specimen of linen thus treated has

been forwarded to us, which is quite incapable of burning with a flame. The process is represented as consisting simply of immersion in a liquid and hanging out to dry; the act of mangling or ironing afterwards does not lessen the effect.

Any communication for W. R., is requested to be addressed to the care of the Editor of the *Mechanics' Magazine*.]

PREVENTION OF FIRE—COLONEL MACERONE IN REPLY TO MR. BADDELEY.

"Think'st thou, because *thou* 'rt honest, we shall have no more cakes and ale?"

Sir,—In No. 964, there is a letter from Mr. Baddeley, animadverting upon my previous week's communication to you, on the prevention of fires. I should not have troubled you with this little notice, were it not for the very high esteem in which I hold the talent, benevolence, and diligence of Mr. Baddeley, with whom I should regret to have any difference of opinion, on matters of fact and public utility. Mr. Baddeley says, that he is "sorry" that the shortness of my memory should have betrayed me so much into error on the subject of fire *prevention*. I do not impugn the correctness of Mr. B.'s statement, as to his having suggested in your pages the iron staircases, "antiphlogistic" plaster, &c. But this I can state, that I have never seen any thing of his, save on the proper use of fire-engines, the supply of water, &c., and excepting his eulogium of the bubble patent cement, the first experiment on which I *saw* exhibited on a doorless, windowless, curtainless, little house in South Lambeth, before a number of scientific gentlemen and directors, in the summer of about (I think) four years ago. I was there the day before the "triumphant" experiment; I saw the cement laid on the ground floor doorways. I took a portion of it home with me, and found it to consist of Roman cement, size, and alum. I saw the tubs of Roman cement, those of size, and others, which, not being open, I cannot swear contained the alum. True, in my last letter I forgot to mention the alum. But on the subject of anti-combustion appliances to timber, thatch, and linen, my memory has not "betrayed me so far" as to make me forget that I applied a solution of alum to dimity curtains, and to the canvas of theatrical s[...] Naples, so far back as 1811. M[...] I wrote on that subject, and on [...] plan, and on iron staircases, to th[...] and *Chronicle*, full twenty ye[...] Five years ago, I wrote on t[...] matters to our *Mechanics' M*[...] with the addition of instruction[...] der quite incombustible the t[...] cottages, barns, in fine, all th[...] saturating the whole straw with [...] whitewash, with a pound of al[...] pailful.

Neither in my article to wh[...] Baddeley objects, nor in any ot[...] I denied a fact of which I [...] know, nothing, *i. e.* Mr. Baddel[...] ing written to you about any ot[...] *ventive* from fire, save and ex[...] warm eulogium on the "Pate[...] proof Cement." I will not [...] mention, that I have also pro[...] soak deal boards in a strong s[...] alum, and also to paint them wi[...] composed of linseed oil, colour, [...] alum. The *surveillance* which [...] mend to prevent architects and [...] from placing their fire flues i[...] position with the deal boards a[...] timbers of houses would not, in [...] nion, be, as Mr. Baddeley calls [...] outrageous infraction of the liber[...] subject." There are innumera[...] existing, which, for the (at le[...] tended) benefit of the communit[...] infringe upon the lieges' libertie[...] for example the whole body of [...] cise Laws—the laws against fre[...] (in many commodities) free [...] free speaking, &c. But the lis[...] laws would cover far more pape[...] have at my disposal. At any [...] insurance offices ought to resist [...] ment of all sums claimed for [...] done through such reckless an[...] arrangements of fire-flues and de[...] as have lately destroyed the H[...] Parliament, the Royal Exchange [...] of the Reform Clubhouse, an[...] stately mansions.

Yours obediently[...]

MA[...]

P.S.—I will send you an ac[...] the experiment at the South [...] house, *which I witnessed.**

* [This experiment was described at [...] by Mr. Baddeley, in our 778th No. Ed[...]

E AND PRACTICIANS, v. MATHE-
S AND MATHEMATICIANS—S. Y.
PLANATION.

last week, in our Notices to Correspond-
t we declined inserting this letter, be-
our judgment, it exceeded the limits of
ission. The writer has since given us
on to leave out the parts we considered
rly exceptionable, and it is now published
e parts omitted. What remains will, we
loubt, be quite sufficient to vindicate the
om all suspicion of having intentionally
sented Mr. Cheverton.—Ed. M. M.]

I should have thought Mr. Che-
ight have managed this discus-
out parading his own notions of
or attacking mine; but as he
hosen to do so, I must explain
n he quoted somebody's censure
59, I was led to suppose it *might*
own, by his remark, that the
appeared to know me well;"
emark struck me as being dis-
e to Mr. C. For, as he and I
strangers to each other, I did
ow it was possible for him to
d any opportunity of forming
acquaintance with my character-
could justify his saying whether
was not, apparently well known
rd person; and I consider a
honest man would not give an
upon any subject upon which he
r possessed the necessary means
ng one. But I suppose Mr. C.
different view of the matter;
e, he would probably have
a lower and more discreet tone
g "blunted perceptions," and
her offensive personalities, with-
aid of which, it would seem, he
ot how to conduct his defence.

heverton's paper in No. 956 ap-
me an attack upon the mathe-
and when I read it, I thought
g would be wasted upon such a
on, and that to make its weak-
nifest, nothing more was neces-
to place the contradictory as-
conspicuously; or to change the
which the statements were
as to state an extreme case, of
the same nature as that de-
in each of Mr. C.'s charges
hat science; and I suppose, by
so very angry, he feels that in
I have succeeded in exposing
s of his paper.

* * * *

Mr. C. denies that he *intended* to
science; and seems unable to conceive that there may be a vast difference between what he intended and wha he performed. Let us examine.

* * * *

In No. 956, Mr. Cheverton, speaking of Mr. Pilbrow, says, "not perhaps that he himself is a mathematician, but an instance, not at all uncommon, of the *baneful effect* which a blind indiscriminating admiration of the science, *or even an imbibing of the spirit of the science, has generally upon our modes of thinking and reasoning.*" And in the note appended, it is said, "As a curious instance of *the influence which this science indirectly exerts*, not indeed in producing baneful effects—*for that is too sober a word*—but in *leading a writer into a display of ludicrous pedantry and solemn foolery*," &c. &c. May not any science which does *even* this—and I could quote many other charges of a similar description—be fairly called a *noxious science?* The spirit of *the science* is distinctly charged, in the first of the above passages, with having a "baneful effect" upon our *modes of thinking and reasoning;* and the passage from the Commissioner's report is cited to prove the *worse than baneful influence* which "*this science indirectly exerts*," and NOT "as an instance of the ludicrous, rather than the baneful effects of imbibing the spirit of the science," &c., as Mr. C. *mis*-represents in No. 963. Again, the *baneful effects* are clearly described, in No. 956, as arising from "*this science*," and from an "*imbibing of the spirit of the science*," and NOT as "flowing from a blind indiscriminating admiration of it," as is erroneously asserted in No. 963. I have here pointed out the true meaning of the passages quoted, which no reference to the context, *as it exists in No.* 956, can alter; and if any one doubts that I have done so, I beg he will be good enough to refer to page 442, and judge for himself. If Mr. C. had merely pointed out the ill effects of a blind, incautious, and improper application of the pure science to practical purposes, no one would have been more ready to commend him than I should; but I consider he did not do so.

* * * *

I am, Sir,
Your obedient servant,
S. Y., (an Engineer.)

January 24, 1842.

ON THE CAUSES OF INJURY TO STEAM BOILERS.—BY C. W. WILLIAMS, ESQ.

Sir,—In my last paper on this subject, I explained some of the causes of those injuries to which steam-boilers are exposed, and dwelt on the circumstance, that the sediment assumes two distinct forms, namely, that of a solid crystallized incrustation, and of a loose mud-like body, held merely in suspension. I showed that the first could not be the cause of injury to the iron plates of boilers, inasmuch as it was itself a good conductor of heat; whereas the second—the floating matter—would become a positive non-conductor, if allowed to subside, when the boiler had been at rest for some hours, and when it would assume the dry hard consistence of plaster of Paris.

I now propose to give further proofs of the conductibility of this solid crystallized incrustation, and draw some important inferences therefrom. I had two pins constructed, to act as conductors, each three inches long and three-quarters of an inch square, one made of iron, and the other cut from a large slab of incrustation taken from the interior of a marine boiler. These were inserted into separate vessels, containing water, the one end projecting half an inch into the water, through the side, and the remaining part projecting outwards, to receive the heat from a powerful gas-burner. These vessels were so protected, that no heat could reach them, except what passed longitudinally, and exclusively through the conductor pins; consequently, the water received no heat except what was conveyed, by conduction, through those pins.

By means of the *iron* conductor pin, the water was made to boil in 13 minutes, and by the *incrustation* conductor pin, in 17½ minutes. That the pins themselves were not raised to any inconveniently high temperature was proved by the fact, that when suddenly removed from the flame, which was very intense, and while the water was fiercely boiling, the pins themselves were at a temperature so low as to allow the finger to be pressed against them without inconvenience; it certainly did not appear to be above 500 or 600 degrees—a temperature far too low to produce any injurious effect on their structure. This experiment resembled the well known one of taking a kettle containing boiling water from the fire, and placing it on the hand, for an instant, and without injury. I may here observe, that I was not able to discover any difference between the temperature of the two conductor pins.

Now, since no heat was received by the water, in either case, except what passed longitudinally through the conductor pins, it is manifest that the entire heat which raised the water to the boiling point, and maintained it in a state of active ebullition, must have passed through a vertical section of the side of the vessel, of but three-quarters of an inch square. This experiment therefore proved, first, that this three-quarter-inch surface of the boiler plate was sufficient for the transmission of a quantity of heat out of all proportion greater than could have been transmitted by such area under ordinary circumstances; second, that this incrustation, (which was crystallized sulphate of lime,) possessed an admirable conducting property; and, third, that no possible injury could be sustained by the conductor itself, so long as its temperature remained so low.

The first of these facts shows how erroneous have been our previous modes of estimating the evaporative power of any kind of boiler, or fuel, by calculations drawn from the mere areas of the exposed plates; while it proves that much may yet be done in this department of the boiler. The second shows that, in this crystallized state of the deposit, it cannot be the cause of injury to the plates, although the uncrystallized or loose matter, if allowed to settle and become hard, becomes a mischievous non-conductor, and the direct source of injury from overheating and bulging. The third proves, that if the recipient body to which the heat is conveyed be able to absorb the heat as fast as it is passed through the conducting body, no injury can be sustained by the latter, seeing that this solid mass of incrustation, (hitherto supposed to be a bad conductor,) itself remaining unaffected, was equal to the conveyance of a very powerful heat, through no less than three inches; while, in fact, it never reaches to above half an inch in thickness on those parts of boiler plates which are exposed to the greatest heat.

Now, to apply these facts, and the in-

to which they lead, to practice. : that, so long as the water is ed in contact with the plates which heat is conveyed by con- no injury will be sustained. But tion arises—what is there to in- this contact, and what other re- than water, are to be met with s? In land engine boilers, no an arise to the plates from any ance connected with the furnace beyond the ordinary wear and e sources of which will be here- amined,) if due attention be paid liness in the interior, and main- he water at its proper level. Ma- ers, however, from their peculiar- nstruction, are subject to another f injury, and which is too often ive of the plates connected with rnaces and the parts adjacent. eculiarity consists of numerous narrow passages. In these, the s fast as it is generated, becomes, on of its ascending current, so with the water, as seriously to : the free and continued access of r to the plates. This also takes the greatest extent in those parts re exposed to the highest temper- ince such ascending current of s necessarily the greatest where t is greatest, namely, in the side f the furnaces. The consequence these side plates, through which : is conveyed to the interior of rrow passages, are more fre- overheated and bulged than arts, though exposed to even a her temperature from the direct f the flame.

heating of the side plates of the s of marine boilers, may therefore to arise solely from the circum- that by reason of the conflicting s of steam and water, in those passages, or water-ways, the re- being then a mixture of water m, (too often of the latter alone,) t cannot be taken up as rapidly as al conveys it, and the usual con- es of over heating necessarily fol-

: interposition of steam, where lone should be found, and its ine- injurious consequences, were strik- lustrated in the first boilers of the antic steam ship, *the Liverpool.* boilers, *the water spaces* were above 5 feet perpendicular, and but 5 inches wide, thus leaving a space of but 2¼ inches for the water approaching the side plates of each of the furnaces, and the steam generated by the heat received through such plates. This steam was necessarily so great in quantity, as to prevent the access of the water, and in fact became itself the recipient of the heat from the furnaces; the consequence was, that the plates became overheated, bulged, and cracked, and extensive in- jury was sustained by them during every voyage. Not unfrequently they required to be wholly removed and replaced at a considerable expense before a new voyage could be commenced.

That steam, in fact, was the recipient of the heat in those narrow passages, where water should always predominate, was proved by a very simple and con- clusive experiment of the engineer, dur- ing one of his voyages. He introduced a trial pipe in the space, (erroneously, in this instance, called the *water*-space,) between two of the furnaces, and on a level with the fuel—the inner end open- ing into such space, and the outer end projecting outside the boiler, and being furnished with a stop-cock. The result proved his anticipation; for on trying this pipe, when the furnace was active, he could never draw off any thing but *steam.* This circumstance was con- clusive, that although the water continued at its proper level in the boiler, yet, by reason of the confined nature of the passages, and the absence of a free circu- lation and access of the water, (at the very place, which of all others, required its continual presence,) the steam, a bad recipient, had usurped its place. This source of injury continuing, the furnace side plates, as constantly, were deranged, while the roofs and other parts remained sound to the last.

From the instance here adduced, it does not follow that any given width of water-space is necessary, or that narrow spaces must always be injurious. I have frequently observed that spaces of but 3 inches wide between the furnaces have been unattended with injury to the plates. The cause of injury then, arising from the predominance of steam instead of water, is rather to be traced to other circumstances connected with the circu- lation of the water in the boiler, and the aids or impediments it receives from the

peculiar construction or arrangement of the flues.

The main practical consideration, then, in seeking to protect the plates of boilers from overheating, is, that it is not to the fire, or furnace, that attention should be directed, but simply and solely to the nature of the recipient to which the heat is conveyed, for in this will be found to rest the whole question of injury. This will be objected to by those who have hitherto anticipated danger from hard firing and incrustation, and the want of due proportions between the fire and flue surface. Yet I state the position broadly, after the fullest investigation and the most conclusive proof, that if we look to the recipient and its heat-absorbing properties, and attend to the interior of the boiler, and preserve all right in these respects, we shall do all that is practicable towards preventing injury from overheating, or what is erroneously termed "burning the plates."

Let us now enquire what are the several recipients of heat which present themselves in ordinary boilers. These are:—

1. Water.
2. Steam.
3. Air.
4. Deposit crystallized.
5. Deposit uncrystallized.

The two latter have already been examined. I have now to speak of the three first mentioned, and this I will do in my next communication.

I am, Sir, yours, &c.
C. W. Williams.

Liverpool, February 7, 1842.

ON EVAPORATION BY CONDUCTION. BY C. W. WILLIAMS, ESQ.

Sir,—In reply to the observations of your correspondent, C. W., in your last week's Number, suggesting improvements on my mode of increasing the evaporative power of boilers, I fear he overlooks the main object contemplated by me, which is, not to increase the interior heat-distributing surface of a boiler plate, but to enlarge its exterior heat-absorbing surface. In fact, I require no addition to the inner surface; not on account of the difficulty of removing deposited matter, but because the plane inner *side of an iron plate is* quite sufficient for *the transmission* and distribution of all *the heat that could, by* possibility, be received by the plane outer side of such plate. "Ribbed plates," as suggested by your correspondent, certainly have their value in many respects; as where a slower and more uniform absorption of heat by the liquid is advisable, as in some saline, gelatinous, or other bodies; but, with reference to my object, the mere evaporation of water, such I have found in a great degree to be injurious.

There are in boilers the two surfaces or sides of a plate to be attended to, namely, the inner, or heat-distributing surface in contact with the liquid; and the outer, or heat-absorbing surface exposed to the fire or flue. Now, I find that the former is adequate, not only to the distribution of as much heat as can be taken up by the latter, (both being plane,) but even to ten times as much. This is the origin of my plan of increasing the evaporative power of a boiler, and which consists in enlarging the outer receiving surface, so as to obtain a larger quantity of heat. With this view, I present to the action of the heated gases passing through the flues of boilers a large additional absorbing surface, and without adding any thing to the interior distributing surface. The use and value of the pins arises from the well-known property of metallic bodies to transmit heat by conduction. These pins I construct from two to four inches in length, beyond which there can be no practical advantage gained.

Being now engaged in a series of experiments, on the large scale, on this important subject, I will recur to it on a future occasion.

I am, Sir, yours, &c.,
C. W. Williams.

Liverpool, February 9, 1842.

SINGULAR PHENOMENON—BURSTING OF GAS PIPES.

Sir,—The bursting of water pipes is a subject that has been very fully discussed in your pages, and one that was supposed to be tolerably well understood; but a circumstance has just occurred that appears to distance all our knowledge on this subject.

By protecting my water pipes with ashes, as stated at page 19 of your 961st Number, I have preserved them uninjured through the frost; but I have a syphon pipe, leading from my water de-

into the garden, with which I took her course.

his syphon consists of a piece of half-drawn tin tubing, such as is used ;as fitters, 15 feet long and $\frac{4}{8}$ths of inch in diameter externally; the er leg of the syphon is about 8 feet, short leg about 4 feet in length: the ier is led down a brick wall, to which lightly secured by wall-hooks; the r dips into the cistern. At the latter of October last, before the frost set having no further occasion for any r in my garden, I emptied the sy-i, but afterwards shut the cock—h terminates its lower leg. One day, week, I attempted to refill the syphon xhausting the air from its longer leg, failing in this, I began to look for the e, when, to my great surprise, I d the empty pipe had actually burst it 9 inches above the cock; not a mere but a palpable enlargement of the pipe, a rupture exactly as shown in the ac-panying sketch. The only pressure I can conceive to have been operating

iin the pipe, is that which would e from a slight compression of the within *the syphon, as the water rose the cistern around and within* the shorter leg, a pressure that would seem to be altogether inadequate to account for the effect produced.

We have frequently heard of the bursting of gas-pipes, an idea which I have always scouted, seeing that the pressure within them never exceeds that of an inch of water, and yet this fact has been most confidently asserted as the cause of several destructive fires. It happens unfortunately in these cases, that as soon as the gas becomes ignited at the aperture thus made, the metal is almost instantly melted, and prevents any observation being made. The positive bursting of such pipes, however, *under slight pressure*, or in consequence of some disintegrating property of the metal of which they are composed, seems to be demonstrated by the fact which I am now describing. The explanation of this phenomenon is of infinite importance to our domestic safety, as proving the liability to accident from this hitherto unperceived cause, and it also becomes desirable to know whether *leaden pipes* are subject to the same law.

The alternate expansion and *partial contraction* of leaden pipes, is well understood; how far tin may be subject to a like influence, and whether this will go any way towards explaining the phenomenon in question, I leave your better informed readers to explain. Any persons interested in this question are welcome to inspect the ruptured pipe, which shall remain untouched for a week or so.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

29, Alfred-street, Islington, February 3, 1842.

SUGGESTIONS FOR THE IMPROVEMENT OF CANAL NAVIGATION.

Sir,—During the rapid progress of railways our canals have been less thought of, but there is no doubt but the present mode of canal conveyance may be much improved. The principal object to be gained is a quicker transit of goods or passengers, which can only be effected by the boats passing along the canals at greater speed and by being less detained at the locks. It is admitted that a boat at a quick speed meets with less resistance than one at a slow speed. We have had reports of several trials of boats being

propelled by steam, but we never had a trial of the following plan—a towing-path on each side of the canal with iron rails, and an engine similar to our present railroad, propelling a limited number of boats. Where it is actually indispensable for the canal to rise or fall, there might be some description of lock similar to "Salt's Perpendicular Lift," as described in your Magazine, vol. xxxiv., page 465, which would at once move a boat from one level to the other, and save the great loss of water consumed by our present locks. The engine must be either removed by an inclined plane and the assistance of a stationary engine, or passed over the canal by a swing bridge to the other towing-path where it would be required to convey boats in the contrary direction, and another engine might be in readiness on the other level to continue the line of boats formed. The stationary engines would prevent the locks being stopped by frost in winter. Where tunnels were actually required, there must either be a stationary engine or towing-paths through them. A canal with a single towing-path would be more economical. The above plan would offer a delightful trip—no concussions or unpleasant motion in travelling, and less work for coroners and jury-men.

GESTATOR.

Liverpool, Feburary 3, 1842.

E. A. M.'S NEW THEORY OF THE UNIVERSE —EXPLANATION OF TERMS.

Sir,—In reply to the remarks with which Mr. Pasley has favoured me, I can only say, that I shall always be ready to adopt any term that may be deemed preferable to my own, as soon as I am satisfied that it fully expresses my meaning. In accordance with my theory, the *medium of space* would consist of a simple medium with solid atoms differently disposed, as explained in your 963rd Number, and that it is only in communication with organic matter that a *different disposition of the atoms with the medium* occurs. In my first paper I stated that I used the term *firmamental fluid* to express the original light which was first created, and which required to be re-constructed by the sun to adapt it to the eye. Earth and heaven, in a material view, only mean body and light. As the word *light has so many meanings,* I chose (perhaps injudiciously) the term firmamental fluid, but with the express intention to make it understood, that the said fluid was to be found every where, except where interrupted by solid matter. In further illustration of the description of the medium, it may be as well to observe, that the presence of the solid atoms in the medium occasions a denser atmosphere round each atom, so that when they are pressed together they restore themselves to their original distances. The tendency to produce stillness and compactness in the cold medium, and the tendency to promote motion and diffusion in the hot medium, I have, perhaps, improperly designated freezing and heating principles. I am unused to discussion. By a chemical change, I mean a variation in the disposition of atoms, which occasions a variation of sensation.

"The friction attendant on life" must surely be an important agent in the conversion of the cold medium into the hot medium. Whether a man be passive as an Esquimaux, receiving his last gulp of blubber from the *fair fingers of his lady,* or alert as the conductor of a steam train; whether he be simple as a new-born babe, or "wise enough for fools to think him mad;" whether he earn his bread by the spade, or the "frictioning about" of the harlequin,—I have not the least doubt that every state tends to the benefit of the whole. As long as he *draws his breath,* the "friction attendant on life" will perform its office. What, if 800,000,000 of human beings, &c. were destroyed at the deluge; can any one look at a glass of water through the solar microscope, and imagine that this would occasion a scarcity of animal life? A little difference perhaps in the method of performing the same operation.

All theories appear easy to the mind that forms them. Mine assigns a purer element for organic nature than exists elsewhere, consequently, a becoming seat for life; while it at the same time converts a condensing power into a diffusive one, the whole being of course in a state of motion. Is this difficult? The machinery of the universe, materially, appears to have been completed on the fifth day; consequently, the existence of man was not necessary to the motions of the solids of the universe.

I have neither ambition nor conceit: I am fully aware of the disadvantages un-

ıich a person resident in the coun- ithout friends whose taste leads to the same pursuits, attempts to forward a subject of so much im- ce; but as it appears to me to offer ıdation on which many very inter- explanations may rest, I am anx- o have it rightly comprehended, ıall always be happy to discuss any which may appear to be doubtful, with Mr. Pasley, or others of your pondents.

remain, Sir,

Your obedient and obliged,

E. A. M.

ıary 2, 1842.

PROCESSES OF QUARRYING AND POLISHING GRANITE.

: extract the following interesting de- on of these processes by Lieut. New- from Minutes, in the *Athenæum*, of the ıctions of the Asiatic Society.]

most usual mode followed in India is ›loy the agency of fire. In this pro- he granite rock is covered with dry ı of the various acacias common on the , which are then fired, and kept burn- til quite consumed. The intense heat a separation or exfoliation of the gra- o the depth, perhaps, of 24 inches, in ntre of the fire, but gradually thinning vards the edges. The piece thus ex- d is then detached, by driving in small vedges at the extremities, and is finally by a powerful lever. Sometimes the roves more refractory than usual, and t is customary to pour cold water upon en hot, or to drop on the surface a boulder of greenstone or granite. ı blocks are required for statuary or tones, or for any other purpose where :r thickness than one or two feet is site, another process is followed, pre- similar to that employed by the ancient tians in quarrying the granite of Syene. eat number of holes, an inch square, f different depths, according to the size : block wanted, are bored in the rock, to each other, forming a connected around the piece to be detached. Each is then fitted with an iron wedge, and hole are simultaneously and unremit- r struck with iron hammers, until their d force overcomes the adhesion of the :. The chisels used in piercing the are kept cool, by pouring water upon while working, as is done in Europe. n long and thinner slabs are required for es, *pavements, lintels, &c.*, a third process is employed, combining the principles of the two former. The rock is heated, as in the first mode, and the separation is completed by driving wedges into a chain of holes, as in the second. In this way Lieut. Newbold has seen blocks of 80 feet in length separated. He also observed that the Hindus take advantage of the calorific action of the sun's rays, in promoting the separation of the granite slabs; and that they, therefore, select the hot season for their work. He found the temperature of a rock at Dewanconda to be 120¼°, while that of the surrounding air was only 100° in the sun, and 95½° in the shade. Sometimes they pour cold water into the clefts made by the wedges, which greatly hastens the separation of the block. The polish given to Indian granites is at least equal to what is found in Egypt; and good specimens may be seen in the Mausolea of Golconda, at Bejánugger, Galberga, and many other places in the peninsula. To effect this beautiful polish, two processes are followed. When a flat surface is required, the granite is slightly smoothed and flattened by an iron tool; and is then rubbed with a large and heavy block of granite, hollowed on its under surface, and having the hollow filled up by a mixture of lac and corrundum. The mixture adheres strongly to the stone, which is tightly fixed between two rods. The extremities of these rods form the handles for two workmen, who draw the stone backwards and forwards over the block to be polished, occasionally throwing water on the surface, to prevent the lac from melting. When the piece to be polished is of a more varied form, as a cornice or moulding, or figure, a piece of wood, with the corrundum mixture, or even a lump of the mixture alone, is used instead of the granite polisher. Any one who has seen the process will be strongly reminded of it by the paintings at Thebes, representing sculptors polishing a statue, which are copied by Rosellini, and in Wilkinson's "Ancient Egyptians." Lieut. Newbold mentioned a remarkable fact connected with the granite of India; that much of it was in the form of spheroids and bosses, having a concentric laminar structure, like the coats of an onion, which frequently exfoliated by the action of the air, throwing off curved laminæ of very varied magnitude. This exfoliation of mountain masses produces some of the most picturesque features of the Indian landscape. It is the cause of its singular dome-shaped mountains and mamillary masses, crowned with tors which would in England be considered Druidical. Rough sketches of some of these, from Bellary and Bavagudda, were shown to the meeting, strongly resembling the Cheese-ring and Logan-stone, so well

known in Cornwall. The paper concluded with some account of the uses to which granite is applied in India; and a brief notice of the colossal temples and figures, and of the pillars, obelisks, and bridges of this material existing throughout the peninsula.

APPLICATION OF THE ARCHIMEDEAN SCREW.

Sir,—In your last Number, 965, there is an error of the press, of much consequence to my statement. For 1837, read 1827, which was the year in which I presented my Screw, or "Archimedean" Ship Propeller, to the Lord High Admiral, which he thought proper to reject as quite inapplicable.

I am, Sir, your obedient servant,

F. Macerone.

THE PECULIAR CASE OF OXYDATION.

Sir,—In Number 963 of your valuable Magazine, a "Constant Reader" wishes to obtain some information respecting a peculiar case of oxydation in a carpenter's stove; I beg leave, through your pages, to give him what knowledge I may have upon the subject: When he has covered the carpenter's stove with plank outside of the flanges, leaving sufficient space for sawdust, he finds the stove to be rusted $\frac{1}{16}$th of an inch. Now, I think that the sawdust must either be damp, when placed between the iron and the plank, or the steam might possibly get through the flanges, and damp the sawdust, which would then oxydise the iron.

The insertion of the above will oblige your obedient servant.

W.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

John Stewart, of Wolverhampton, Esq., *for certain improvements in the construction of piano-fortes.*—Enrolment Office, Jan. 7, 1842.

The first of these improvements, which are five in number, consists in forming the frame of metal divided into compartment for the reception of the sounding-boards, which are only connected with the frame at intervals.

The second improvement relates to the mode of constructing and applying sounding-boards. These sounding-boards, three in number, are denominated the *treble*, adapted to the smallest partition of the frame; the *tenor*, occupying the middle compartments, and a size larger than the former; and the *bass*, which is considerably the largest, and is fitted in the remaining partition of the frame.

The third improvement relates to an improved mode of applying the bridges; these are of beech, 4 feet long, and half-an-inch wide at the treble end, gradually widening to three-quarters of an inch at the bass extremity. The bridge is arched into twenty-one abutments, each of which rests upon the sounding-board. The pins for the lower frets are placed on the top of the bridge, (which is perfectly straight,) as usual.

The fourth improvement consists in a new mode of stringing, by hanging the wires in small slides fixed in the upper edge of the stud-bar, whence the wires are carried to the pins at the lower edge of the bar, forming the upper frets; the strings then pass down to the bridge in the ordinary way, forming angles between the respective pins placed therein, and after passing below the bridge they are hooked upon steel wires ten inches long, twisted double, with an eye at one end and a hook at the other. The eye is attached to one of the screws of the screw-bar after passing the tension-bar; the other end has a strong steel or iron wire hook, to which a string is attached; it is then turned in the usual manner.

The fifth improvement consists in applying the action to upright piano-fortes, by placing the action underneath the keys, and causing the hammers to strike the wires in two distinct lines. The first line of hammers begins at the highest treble wire, and proceeds gradually downwards beneath the stud-bar to the centre of the scale. The second, or bass line begins at the usual distance from the feet placed on the bridge, and is progressively carried up in an oblique direction to the last note of the bass. A descending wire, or other appropriate connection is adapted to the end of each key, its length being varied to suit the position in which each particular hammer is required to strike its string.

Owen Williams, of Basing-lane, London, Engineer, *for improvements in propelling vessels.* Enrolment Office, February 4, 1842.

The first of these improvements in propelling is carried out in the following manner:—Two cranks on each end of the engine shaft project beyond the sides of the vessel; to these cranks two rods are jointed, to the lower ends of which floats or paddle-boards of wood or iron are affixed.

Immediately under the crank-shaft are two axes or guides, through which the paddle-rods slide freely, the guides at the same time turning in a horizontal direction. These guides act as fulcra, and also regulate the

at which the floats enter and leave the .

econd improvement is intended to take tage of the pitching and rolling motion vessel, and thereby effect its propulsion; is purpose, two flat horizontal floats, oyant surfaces, are placed one under quarter, and attached to two upright or stems. These rods are connected by ints and two parallel bars to the ves- sides; the rods passing up into the l, are there attached to the end of pump , which raise and force water out of the , and thereby propel the vessel. The may either be immersed in the water, at on its surface, and may be applied, y convenient position, either to work s, or, by the intervention of suitable anism, give motion to any kind of pro- g apparatus. How much oftener will lelusive scheme be patented?

OMAS STOPFORD JONES, OF TAVI- K-PLACE, RUSSELL-SQUARE, GENTLE- *for certain improvements in ma- ry for propelling vessels by steam or power*. Enrolment Office, February 42.

ese improvements consist in the em- ent of two series of cranks for causing oats or paddles to describe an elliptical and to enter and emerge from the at favourable angles.

r this purpose, a main crank-shaft, of iven throw, projects from the engine beyond the side of the vessel. Imme- y over it, but at such a distance as to the two cranks to revolve clear of each , is placed a second crank, having a er throw than the former. The neck main crank works in a suitable bearing e upright stem of the paddle or float l, the head or upper part of which stem slide drop link groove, within which rasses in which the upper and smaller work slides up and down, as the crank ves, thereby compensating for the dif- ce between the circles described by each. his means the paddle or float board is to describe an elliptical path, and also ter and quit the water at a favourable .

hen two or more paddles are employed, are placed one behind the other, in the tion of the vessel, each paddle stem g a large and small crank, connected her so as to be driven by the main shaft of the engine; three of these ellers are shown as thus applied.

e claim is to the two cranks of different s for each paddle-shaft, and the link and g brasses by which the two cranks of dif- t throws are enabled to act in unison, and *give any degree of an angle that* may be preferred to the paddle-boards, both in entering and leaving the water.

JAMES WARREN, OF MONTAGUE-TERRACE, MILE-END-ROAD, *for an improved machine for making screws*. Enrolment Office, February 4, 1842.

The object of this invention is the enabling of moulds for casting screws to be made in moulding sand, by screwing patterns of the screws therein, and then withdrawing them by unscrewing, so as to leave patterns of such screws impressed in the sand, or such like material. Two rails, or tramways, are fixed lengthways on the top of a strong bench, upon which a plate of iron traverses to and fro, by means of four small wheels or rollers. A moulding head plate, having the patterns of the heads of the screws upon it, and properly gitted and sprayed, is placed in the sand tub, and a moveable iron moulding-box placed upon it; this box is then filled with sand, slightly pressed and levelled. A board is then laid on the top of the box, the usual way, and turned over, when the upper part of the sand will retain the impressions of the heads of the intended screws, and also of the gits and sprays. This box is then placed upon the iron plate on the carriage, with the patterns upward, and rolled under a screwing frame; three plates, the head plate, the steadying plate, and the guide screw plate, are brought down upon the moulding box, and secured there by studs. Each of these three plates contains as many holes as there are patterns used in the machine. In the upper part of the machine there are three cog-wheels, which are worked by turning a handle affixed to the middle one, and give motion to the outer two, to which the motion cranks are attached; these cranks give motion to a crank-plate, having the same number of holes as there are patterns employed. Each of the pattern screws terminates at top in a crank, which takes into the crank plate, so that on giving motion to the working cranks, all the screws are simultaneously turned round and screwed into the sand, by means of suitable guide-screws, &c. On reversing the motion, they are unscrewed and withdrawn, leaving the pattern of the screw impressed in the moulding sand. The screwing-frame is then raised, and the moulding-box drawn out, to make room for another. A corresponding moulding-box being filled with sand, its smooth surface is placed upon the impressed surface of the first, and being clamped together, the fluid metal is poured in. When the boxes are separated, the screws will be found perfect, except the nick or slit in the heads, which may be made with a circular saw, in the usual way; or the nicks may be cast in the heads of large screws, by making them in the patterns.

RECENT AMERICAN PATENTS.

[Selected and abridged from the *Franklin Journal.*]

HORSE POWER FOR DRIVING MACHINERY; *George Strenge and Jacob Rohrer.* This is for an improvement in that kind of horse power in which the power is applied, by causing the horse to walk in a circle, and to draw by means of a lever or sweep attached to a vertical shaft; and it consists in the peculiar manner in which the levers or sweeps are attached to the main driving wheel. The patentees observe, that "sweeps of this description have heretofore been fastened to the main shaft, in such a manner as not to allow of their having any vertical play, in consequence of which, a considerable portion of the power of the horse or horses has been expended without the production of any useful effect, and has, in fact, been productive of injury, by racking the machine." In this machine the sweeps pass through staples attached to the main wheel, which staples are so formed as to confine the sweeps laterally, whilst they are allowed to play vertically. The inner end of the sweeps are received within mortises in the upper end of the shaft, and there are springs on the upper and lower sides of the rear ends of the sweeps, which bear respectively upon the main driving wheel and upon the upper part of the staples. The upper springs are provided with an off-set to operate as a latch in confining the sweeps in place.

STOPPING LEAKS IN HOSE; *Ralph Bulkley.* This patent is taken for a mode of stopping breaches in leather hose, whether small or large. Small breaches, or holes, are to be closed by a conical screw plug with a flat head. The point of the screw is to be inserted in the aperture, which, by screwing, is gradually enlarged, embracing the screw until the water is prevented from flowing out. But if the aperture be a slit passing lengthwise, it may be temporarily repaired for use by two corresponding plates of metal, the one to be placed inside of the aperture, and of sufficient length to cover it, there being a corresponding plate upon the outside of the aperture; the two plates are to be drawn together by screws, previously fitted to them, thus firmly binding the edges of the leather between the said plates of metal. If the aperture be so large, or of a description that it cannot be secured by such screws or plates, then a section of metal, or other description of pipe or tube, of suitable dimensions, may be inserted within the defective part, and the apparatus denominated "*breach clogs*" is to be applied thereto; but if the breach required to be stopped be not in itself large enough to admit of the application of the "breach clogs," the water hose may be severed by cutting it entirely across, or incisions of suitable extent may be made for the convenient and necessary application of the said apparatus. The claim is to the "mode of repairing lateral breaches in hose by means of screws, as set forth. Also of repairing larger breaches in the same by means of metallic plates and flexible tubes, inserted in hose, constructed and secured in the manner described."

IMPROVEMENT IN RIFLES AND OTHER FIRE-ARMS; *James R. Thomas.* This patent was granted for an improvement on that kind of guns in which a separate chamber, removeable from the barrel, is used. The separate chamber is made with a projection around the forward end of the bore, which fits into a recess in the barrel, the breech of the gun being made to receive the said chamber. Near the top of the back end, the chamber is provided with a hole, which receives the end of a spring bolt to hold it in place. The spring bolt is drawn back by a projection from the tumbler, which acts against an offset on the bolt, so that in bringing the hammer to the half-cock, the spring bolt is drawn out clear of the hole in the back of the chamber, and on cocking, the projection on the tumbler clears the offset on the bolt, and allows it to return by the action of a spiral spring coiled around it. A part of the lower part of the back of the chamber is bevelled off, so that in putting in the chamber, the bevelled part will force back the spring bolt until the chamber is in place. When the hammer is at half-cock, the chamber is forced up out of its place by a pin passing through a hole in the bottom of the case which receives the chamber; this pin is attached to the end of a spring screwed to the under side of the barrel.

EVAPORATING SOLUTIONS, DECOCTIONS, &c., FOR THE PURPOSE OF CONCENTRATING THEM; *James W. W. Gordon.* The patentee says, "The object of my improvement is principally to obviate the danger of injuring the preparation, which in articles of great delicacy sometimes takes place, by the application of the heat of a water or steam bath only: and this I effect by means of a machine which produces rapid evaporation at the ordinary temperature of the atmosphere."

FLYER FOR TWISTING SILK, &c., *Edward L. Young.* This flyer, instead of having two guide wires run out their whole length parallel to, and at equal distances from the axis, has one short and one long guide wire—the short wire, or arm, extends as far only as the middle of the bobbin, and the longer arm extends to some distance beyond the end of the bobbin, and is there

. so as to bring the guide in a line with is of the bobbin—the guide wire being ntly long to admit of putting on and off the bobbin without moving the A ring is attached to the two guide of this flyer, near the extreme end of iort arm, to prevent the centrifugal from throwing out the guide wires constitute the flyer.

claim is to the method of construct- s flyer.

E ARMS; *Silas Day*. This patent is ed for an improvement on that kind of ns that load at the breech, and it con- n making a curved chamber at the , which opens at the side of the barrel, reception of the load. The side aper- closed by a valve which works on a l is provided with a handle and catch; ve works in a slot made in a block of at projects from the side of the bar- d in which block a part of the curved er is made.

am aware," says the patentee, "that ave been made to load at the breech ing a sliding valve to close the aper- rough which the charge is inserted, t constructed like the plan herein de- , and therefore I do not claim the le of loading at the breech as my in- , but what I do claim as my inven- nd desire to secure by letters patent, curved chamber, and in combination ith the sliding valve and its appen- consisting of the slot and lever, for rpose, and in the manner herein de- l.

TING SCREWS ON THE RAILS OF EADS; *Jacob Lindley*. The ordinary l of cutting screws upon the ends of d rails, is well known to all who are ated with the making of such articles. improved mode, the rail is held in the by a clamp attached to a bench, on d of which there is a puppet head in works a screw, mandrel, or shaft, ed with a winch on its outer end, and inner end of each of these is fitted a , very similar to those usually em- for cutting wooden screws, excepting ey are made of steel, and the cutter ned by it, instead of being attached . These sockets are fitted on to the ends of the screw, mandrel, or shaft, ocket, and secured by a thumb screw, eans of which the precise point at the threads, on each end of the rail nd, can be regulated. That end of the , on which the cutter is situated, is d off, and the cutter is so formed as under the shoulder.

claim is to the "manner of forming the cutters for cutting the screws on the ends of the rails, by making them a part of, and one with, the sockets, or female screws. Also, the manner in which I have combined and arranged these sockets, the screw shafts, and standards (puppets) with each other, for the purpose set forth."

MACHINE FOR CUTTING CORK; *Charles R. Macy*. The pieces of cork, called blocks, cut into proper lengths, are held between two revolving spindles which grip them, and as they revolve, the cork is cut round by a revolving cutter wheel, the arbor of which is horizontal and has its bearings in a sliding frame. This frame rests upon two cams, on a shaft parallel to, and under the shaft of the cutter wheel, the cams being of such form as that at the commencement of each operation the frame and knife will be lifted up, and cause the edge of the cutter wheel to approach the piece of cork to be cut, and when the cork has been cut, the frame and cutter wheel are let down to allow the revolving gripes to receive another block. The edge of the cutter wheel is kept sharp during the operation, by means of two rotary disks, one acting on each face. The faces of these disks are covered with leather, and emery, or any other substance which will give an edge. As the cutter wheel revolves, to cut the cork, every part of its edge is brought round to these grinding disks. The blocks are fed in through a box, from which they are taken by a jaw which slides forward and places them between the gripes of the revolving spindles.

The claim is, first, to the "combination of the rotary cutter wheels with the sharpening rotary disks, one on each face of the rotary cutter for the purpose and in the manner described.

"Secondly, to the method of moving the rotary cutter wheel up and down at the commencement and end of every operation by means of the sliding frame, acted upon by the cams, for the purpose and in the manner described.

"And thirdly, to the method of feeding the machine with the block by means of the slide and jaw, in combination with the receiving box and spindles as herein described."

The attempts at cutting corks by machinery have been numerous, and have uniformly proved failures; not that corks have not been cut by machinery, but because they have not been so well cut as by hand, and because the preparing and assorting of the blocks to be cut by the machine have required a degree of care and attention which are not repaid by the result.

IMPROVEMENT IN THE MANUFACTURING OF CLOTHS OF WOOL, OR WOOL AND SILK;

R. Daniels. "The improvement consists," says the patentee, "in the remanufacture of wool into cloths of various kinds, such as broad cloths, kerseymeres, satinets, and others of a similar character, and into cloths in which the warp consists of cotton, silk, or other material, and the filling in whole or in part, of wool; or of cloths in which the cotton, silk and wool are mixed together, and are carded and spun in their combined state; all of which I have successfully essayed. The wool so remanufactured I obtain by taking worn-out woollen goods of various kinds, and also worn-out silks, and reducing them to their original state by means of machinery which I have invented for that purpose (and for which I have made application for letters patent, simultaneously with the present application) or reduced by means of any other machinery which will produce said fibres of wool in a state fit for remanufacturing into yarn and cloth.

"I sometimes take such restored wool, and card, spin, and weave it, alone, or I mix it with fresh wool in proportion of, at least, one-sixth part of the restored wool to five-sixths of the fresh wool, and I, in either case, thereby obtain yarn or cloth equal in all respects to that which can be obtained from either fresh, or new, wool of the same degree of fineness, a result not heretofore obtained, and by which I am enabled to produce such cloth, and sell it at a price considerably lower than that of cloth consisting entirely of fresh, or new, wool; as it is a fact which I have established by full experience that the reproduced fibres of wool may be obtained from the worn-out woollen goods, pound for pound, at a very trifling cost."

NOTES AND NOTICES.

A Scientific Commander.—Captain Carpenter is having the pinnace of the *Geyser* Steam Frigate, to which he has been lately appointed, fitted with his own patent propeller. The Admiralty have given permission to have a small engine of 5 or 6-horse-power from the Disc Company for the purpose. There is little doubt of this portable steam-tug being of great service in towing boats with troops, &c., up the rivers and canals in China, to which station the *Geyser* is supposed to be destined. Notwithstanding the number of steamers in the service now, there is not one of Her Majesty's steam-vessels employed either in India or China.—*Times.*

Levels of the Mediterranean and Dead Seas.—At a recent meeting of the Royal Geographical Society, a letter was read from Colonel Chesney, stating that a line of levels had been carried from Jaffa to the Dead Sea by Lieutenant Symonds, of the engineers. The work is said to have come out admirably, and the result is, that the Dead Sea is 1,[illegible] feet lower than the highest house in Jaffa, which, from the height of Jaffa above the Mediterranean, leaves a difference of 1,400 feet between the level of the two seas.

Steam Engines in Belgium.—It is estimated that there are now at work in Belgium 1,300 steam engines, with a total power of 33,100 horses.—*Galignani's Messenger.*

The Little Western.—The proprietors of this steamer (the building of which was announced at page 293 of our last volume), accompanied by several captains of the navy, and gentlemen connected with the commercial and with the scientific and engineering interests of the country, had on the 27th ult., an experimental trip down the river, in order to test the speed and powers of the vessel. The Little Western left her moorings off the Brunswick Hotel at a quarter to 11; the tide then running down, and the wind blowing from the south-west. There was, however, but little wind, and the weather was clear and pleasant. She was accompanied down the river by one of the fastest boats, viz., the Railway, for which she waited off Galleons, and with which she contested head and head to Gravesend. The speed of the Little Western is extraordinary; she reached the Nore Light within 2 hours and 53 minutes from the time of starting, and returned to Blackwall within 2 hours and 25 minutes. The distance is 44 miles. This vessel is built on an improved principle. Her tonnage measurement is a fraction beyond 721 tons. She measures between perpendiculars 200 feet, measurement over all 216 feet. Her keel measurement is 195 feet. Her breadth, clear of her paddle-boxes, is rather above 27 feet; and her breadth over all exceeds 47 feet. Her deck is flush from stem to stern, and she has two masts. Her internal accommodations are very good, as may be surmised from the measurement of her saloon and cabins, &c. The length of her saloon is nearly 44 feet, and the room is elegantly and commodiously fitted up, without being gaudy or fantastic; it is also a good height, and is 24 feet wide. The ladies' cabin is nearly 20 feet long. The engines, which are horizontal and low pressure, are of 80-horse power each. Altogether she is a most elegant craft, and an admirable sea-boat; she has weathered a gale off the Land's-end, and proved her capability to contend against a rough sea and a heavy wind. This vessel was built at Bristol, by Messrs. Acramans, Morgan, and Co. She is a vessel excellently adapted for the London and Ramsgate station. Her prodigious speed, superior accommodation, and tractability, render her peculiarly desirable for trips in which convenience and rapidity are imperative.—*Times.*

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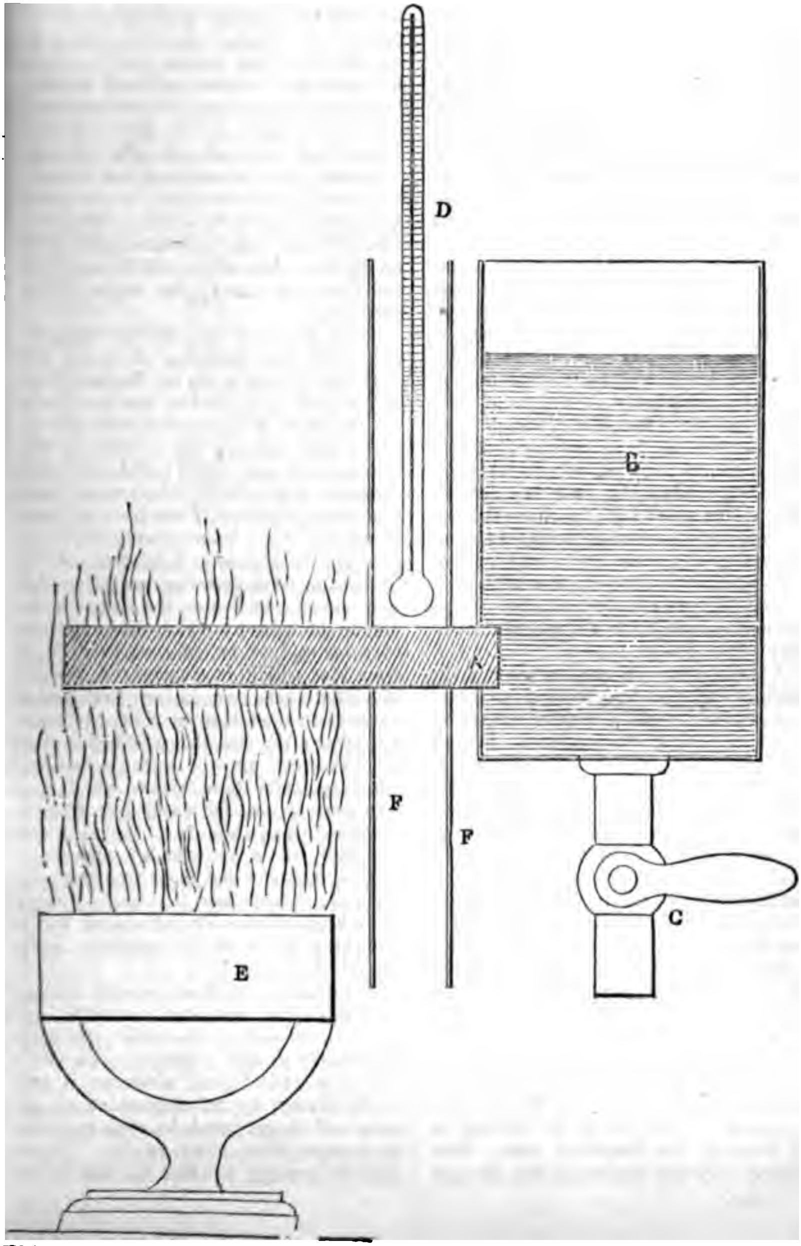
MR. C. W. WILLIAMS'S HEAT CONDUCTOR BAR.—(ILLUSTRATIVE OF STATICAL AND DYNAMICAL HEAT.)



ON THE CAUSES OF INJURY TO STEAM BOILERS. BY. C. W. WILLIAMS, ESQ.

Sir,—In my last communication, I explained some of the reasons which justified our considering that the sources of injury to boilers, (as regards the overheating of the plates,) were referable to the character and heat-absorbing properties of the recipient to which the heat was transferred. I then enumerated the five recipients which present themselves in ordinary boilers, namely, 1. Water; 2. Steam; 3. Air; 4. Incrustation deposit, crystallized; 5. Loose deposit, uncrystallized. Having already examined the conducting powers of the two latter, I have now to consider those of the three first mentioned.

Water is, unquestionably, the most rapid and best recipient for ordinary purposes, and air the slowest and worst. So long as the water in boilers remains in contact with, or has free access to the plates, the latter will sustain no injury, inasmuch as the body or stream of heat passing from the fire, and through such plates, by reason of the superior conducting power of the metals, will be taken up by the water as rapidly as it is passed to them. Hence, the plates themselves—the conductors—remain uninjured, and unaffected, beyond a certain temperature. What that temperature is, I trust I shall be able hereafter to demonstrate, with sufficient accuracy for all practical purposes.

That the plates or conductors remain uninjured by the transmission of heat, even of great intensity, may be illustrated by the following experiment. In the prefixed figure, (see front page,) let A represent an iron conductor bar, three-quarters of an inch square and three inches long, one end being inserted into the vessel B, containing water, and the other end projecting so as to receive the heat from a powerful laboratory Argand burner, E; the intermediate part at G, between the flame and the boiler, being protected by two shields, F F. The flame was inclosed, as is usual in laboratory burners, with a metallic funnel, resembling the glass funnels of ordinary lamps, the bar passing through an aperture in it, made to fit. By this means the heat was confined, and its action on the bar was very great. This funnel is omitted in the drawing, for simplicity sake. Immediately over the conductor bar, though at first not in contact with it, is placed the thermometer D, further protected by the two shields.

In five minutes, the heat conveyed by the bar raised the temperature of the water to 92°, and the bar thermometer to 160°. In twenty minutes, the water reached 212°, and boiled, the bar thermometer being raised to 258°, at which it remained stationary. Here we see the entire heat taken up by the water was passed through the conductor bar, issuing, as it were, from its end at A, and through a section of the boiler side, of but three-quarters of an inch square. The thermometer was then lowered until it rested on the bar, when it rose to 270°, and there remained stationary, the water boiling strongly.

Here we have two distinct temperatures, and two measures of heat. The first, that which is felt by the bar, I will call *statical* heat, that is, the heat due to its *status* as a conductor; the second, that which indicates the current or body of heat conveyed: this I call the *dynamic*, or power-giving heat. These terms, *statical* and *dynamical*, I use from the want of others more appropriate; they are, however, sufficiently indicative of the distinction I am pointing out. I am now desirous of establishing the fact, that the degree of heat by which the conductor may be said to be affected is different from that which is transmitted through it. That there are, in fact, two distinct temperatures or degrees of heat to be attended to; the one, that which the plates or conductors may be said to feel, and which indicates the extent to which their structure or material would be affected; the other, that which is conveyed to the recipient, water, and which it absorbs.

Now, to show that these two temperatures are distinct, and that their relation to each other is solely influenced by the absorbing power of the recipient, I give the following proof.

The bulb of the thermometer indicating the statical heat stands at 270°, and remains stationary at that point, the water continuing to boil violently. To prove that this statical heat, whatever it may be, is affected by and dependent on the nature of the recipient, let such recipient be changed from water to air. This is done by turning the cock C, thus letting

the water out, and allowing the air to have access to the end of the bar at A, from which the heat issues. Air being now the recipient, the current of dynamical heat passing through the conductor bar is not received or absorbed as rapidly as it had previously been, by reason of the inferior absorbing power of the air, as compared with water. The result is, that the current of heat, in its issue at A, being retarded, accumulation takes place in the conductor, the statical heat is increased, and the thermometer instantly tells the fact by rising until it reaches 404, as shown in the following table.

Time in minutes.	Thermometer resting on bar.	Temperature of the water.
0	44	40
5	160	92
10	214	138
15	245	188
20	258	212
25	,,	,,
30	270	Bulb resting on conductor bar.
35	,,	
40	360	The water being run off, and the recipient changed to air.
45	392	
50	398	
55	404	
60	,,	

Thus we see, that so long as water was the recipient, the statical heat—that by which the metal would be affected, injuriously or otherwise—remained at 270°, but, with air as the recipient, it rose to 404°. This statical heat, then, as it indicates the state or temperature of the conductor plates, decides the main question of injury to the boiler; for if the temperature of those plates is thus kept down by reason of the rapidity with which the water absorbs the conducted heat, it necessarily follows, that it cannot amount to such a degree as to affect those plates by overheating, softening, or bulging. This is the practical application of the subject. Thus we see that the temperature of the plate is dependant, not on the quantity or intensity of the heat passing through it, but on the nature of the recipient, and the rapidity with which such heat is absorbed or taken up.

We have thus, I repeat, two distinct temperatures to attend to, namely, the *statical*—that due to the plate or pin, in the capacity of carrier, conductor, transmitter, or conveyer—and the *dynamical heat, that due to the current or quantity* conveyed. The former, we see, is dependant on the latter; in other words, the temperature of the conductor plates of a boiler is high or low, injurious or otherwise, in proportion to the rapidity with which the conducted heat is absorbed by the water or other recipient. I will hereafter show the analogy between this stream of heat passing through the conductor, and the pressure of water through a tube; and that the same statical and dynamical distinction may there also be drawn. In proof of the temperature of a conductor plate or pin being below that of injury or overheating, so long as water is the recipient, I have placed several pins in boilers, projecting from two to four inches, and exposed to the most intense heat, even where the adjoining brick-work was at a white melting heat. These pins, nevertheless, remained uninjured, and doing their duty as conductors.

I may here mention a familiar experiment, which illustrates the fact of the conductor not being injuriously affected by the transmission of heat through it, so long as the recipient possesses the absorbent property which water has. I inserted a bottom, made of a circular piece of card paper, two inches diameter, and made to fit tight, into a tin vessel, and, by means of a little glaziers' putty, made water-tight round the edge. On being held over an Argand lamp, the water it contained was made to boil, while no injury, even to discoloration, took place in the card-bottom conductor; and on being removed from the lamp, it was found to be apparently cold to the touch: thus proving, that although a high degree of heat, dynamically considered, was flowing through this piece of card, the statical heat of the latter was insufficient to injure it.

This leads us to examine the commonly received idea, that the durability of boiler plates will be influenced by the temperature of the furnace, and the degree of activity with which the fire is urged, and which subject I will examine in my next.

I am, Sir, yours, &c.

C. W. Williams.

Liverpool, February 12, 1842.

COMPOUND INTEREST.

Sir,—A question put to me some little time ago by a friend, led to the following calculation, the result of which is curious, and may perhaps be new to some of your readers who may take an interest in such matters.

Let £P be put out to compound interest at the rate of r per cent. per annum, and let A be the amount it will produce at the end of n years; then, according to the ordinary formula,

$$A = P\left(1 + \frac{r}{100}\right)^n.$$

Or, supposing for the sake of simplicity, P = 1, and making $\frac{r}{100} = a$, (the simple interest of £1 for a year at the given rate per cent.,) we have,

$$A = (1 + a)^n.$$

In this formula it is assumed that, according to common usage, the interest is made payable and added to the principal *yearly*, the amount for 1 year being only $1 + a$, or the same as the principal would produce at *simple* interest merely; but it is evident that there is no reason, except a conventional and arbitrary one, why the period of *a year* should be chosen for this purpose, or why the sum should not bear compound interest during the first year; the interest might, if it were thought proper to do so, be made up *half-yearly;* the interest then due for every one of these periods of half a year, at the same rate as before, would be $= \frac{a}{2}$, and, n years being equivalent to $2n$ periods, our formula would become, upon this supposition,

$$A = \left(1 + \frac{a}{2}\right)^{2n}.$$

Similarly, we might make the interest payable *weekly*, in which case,

$$A = \left(1 + \frac{a}{52}\right)^{52n},$$

or, generally, if the year were divided into x periods, and the interest added to the principal at the end of each of these periods, the equation would be,

$$A = \left(1 + \frac{a}{x}\right)^{nx},$$

the value of A depending upon the mag*nitude given to x.*

Now, if these periods have any finite value, however short it may be, the accumulation or adding of the interest to the principal will take place at intervals some finite distance from each other; but it is easy to conceive, that by *indefinitely increasing x*, this distance may be so diminished as to become inappreciable, and thus the principal and interest may be supposed to accumulate together, *continuously*, instead of by skips, this continuity being the limit towards which we approach by making x indefinitely large, or the period of time allowed for making up the interest indefinitely small. The amount of £1 for 1 year, would then no longer be simply $= 1 + a$, but $= \left(1 + \frac{a}{x}\right)^x$, where x is infinitely great in value.

This may perhaps be said to be what the law of continuity would seem to suggest as the true theoretical view to be taken of the nature of compound interest, and it may become a question (perhaps, however, rather curious than useful), what difference does this mode of considering it make in the amount? Or, what amount would be produced in n years, by £P put out to compound interest, supposing the principal and interest to accumulate together *continuously*, instead of at intervals of 1 year, as upon the ordinary system?

It will soon be perceived, that the value of the expression $\left(1 + \frac{a}{x}\right)^{nx}$ increases when x increases, and it has therefore been supposed by some, that when x becomes infinite, A will become infinite too; or, in other words, that A may be made as large as we please by taking the value of the interest period sufficiently small. This, however, is not the case; we shall find that the expression approximates continually more and more as x is increased, towards a certain limit, which it can never exceed, and therefore this limit will be the value of A of which we are in search.

Expanding $\left(1 + \frac{a}{p}\right)^{nx}$ by the binomial theorem, we find it equal to the following series:—

$1+na+n\frac{nx-1}{2}\frac{a^2}{x}+n\frac{(np-1)(np-2)}{2\cdot3}\frac{a^3}{p^3}+$ &c. Or, if the terms be multiplied out, $=1+na+\frac{n^2a^2}{2}-\frac{na^2}{2p}+\frac{n^3a^3}{2\cdot3}-\frac{3n^2a^3}{2\cdot3\cdot p}+\frac{2na^3}{2\cdot3p^2}+$ &c.; which is a series consisting partly of terms not containing x, and partly of those which have powers of x only in the denominators. Now, it is obvious, that by making x sufficiently large, the whole of the latter may be brought as nearly as we please to 0; so that by omitting these, we have, for the *limit* of the expression,

$$A = 1 + na + \frac{n^2a^2}{2} + \frac{n^3a^3}{2\cdot3} + \frac{n^4a^4}{2\cdot3\cdot4} + \text{\&c.}$$

But this series is known to be the one for ε^{na}, (ε being $= 2{\cdot}718$, &c., the base of the Napierian system of logarithms,) whence $A = \varepsilon^{na}$, or in other words, the amount produced in n years by £P put out to compound interest at r per cent. per annum, upon the *continuous* hypothesis, will be $=$ P $\times$ number to Napierian log. $\frac{nr}{100}$; or $=$ P $\times$ natural number to *common* log. $\frac{nr}{230{\cdot}258}$.

An example or two will show the difference between the results of this and the common supposition.

The amount produced by £100 at 100 per cent. per annum, in 1 year, would be, on the common supposition $= 100\,(1+1)^1 =$ £200.

On the continuous hypothesis $= 100 \times$ anti-log. $\frac{100}{230{\cdot}258} = 271l.\ 16s.\ 0d.$ nearly.

The amount of £1000 at 5 per cent. per annum, for 20 years, would be,

On the common supposition $= 1000\,(1{\cdot}05)^{20} = 2653l.\ 6s.\ 0d.$

On the continuous hypothesis $= 1000 \times$ anti-log. $\frac{100}{230{\cdot}258} = 2718l.$ nearly.

The same for 100 years.

On the common method $= 1000\,(1{\cdot}05)^{100}$ = about $131{,}500l.$

On the continuous hypothesis $= 1000 \times$ anti-log. $\frac{500}{230{\cdot}258}$ = about $148{,}400l.$

I am, Sir, yours obediently,

W. POLE.

Bloomsbury, February 3, 1842.

IMPORTANT TO MANUFACTURERS OF GLASS, PORCELAIN, POTTERY, ETC.—NEW MATERIAL DISCOVERED.

Sir,—It is well known that the Americans are endeavouring to supply themselves with earthenware, and that they are in *possession* of the *materials*, which at some future day *may* be made a greater use of. In order to retain the superiority in making pottery, porcelain, &c., that Staffordshire has hitherto had, we must not only consider the best mode of combining our earths and minerals, but also the cheapest plan of obtaining them. Under this impression I have succeeded in obtaining a material which is likely to be extensively used in the fabrication of glass, pottery, porcelain, &c. It possesses one great advantage over articles of similar properties now in extensive use, that of being *cheaper*. *It may be obtained in any quantity, at any season of* the year, and delivered in the potteries at a *less price* than *flint* or *clay*. It is free from any *metallic* mixture, and does not contain (excepting an almost imperceptible portion of carbonate of lime,) anything but pure *silica* and *alumina*, of which there are about four-fifths of the former, and one-fifth of the latter. It would not require the expensive and tedious process of burning and stamping like flint, but merely grinding from a state of *siliceous sand* to powder; and containing already one-fifth of alumina, would only require an addition to be fit for the potter's use. It is difficult to meet with such a *pure alumina—siliceous* compound in nature. The SILICA has been extracted easily by water from the native earth and used at BIRMINGHAM and ST.

HELEN's in the manufacture of FLINT and PLATE GLASS, and was found equal, if not superior, to the sand from the Isle of Wight, now in such general use.

Any manufacturer wishing to make a trial of this new production, may have a sample on application to the writer.

SAMUEL SALT.

Liverpool, 32, Mulberry-street, Feb. 9, 1842.

PATENT FIRE-PREVENTIVE PLASTER, VINDICATED FROM THE ASPERSIONS OF COLONEL MACERONE.

" ——— He has been bred i' the wars since he could draw a sword, and is ill schooled in boulted language; meal and bran together he throws without distinction."

Sir,—I had hoped that my last communication on this subject would have sufficed to show Colonel Macerone, that he was greatly mistaken with reference to the properties of the Fire-preventive Cement; and that he had better either obtain more correct information, or be silent upon this subject.

By your last Number, however, (page 116,) I perceive that my friendly caution has been thrown away—

" He winna tak the hint."

On the contrary, he continues to write most disparagingly of the "anti-phlogistic plaster," *alias*, "the bubble cement:" with what *justice*, your readers shall be enabled to determine.

The highly satisfactory experiment in Dorset-street, Clapham-road, on the 6th of June, 1838, and the (if possible) still more conclusive demonstration of the efficacy of this composition, in Trafford-street, Manchester, on the 23rd of October following, have been duly recorded in your Gazette. Similar public exhibitions have been made in New York and St. Petersburgh. Many private experiments have also been witnessed by architects, builders, &c., and by the officers in connexion with Her Majesty's Board of Ordnance and Dock-yards, Colonel Fanshawe, Captain Jebb, Mr. Ewart, Mr. Lloyd, Mr. Sylvester, and others, who not only expressed their confidence in its properties, but have given orders for its use in the *Lucifer* steam ship, and the Model Prison erected under the superintendence of the Commissioners of Woods and Forests; the experiments having *satisfactorily demonstrated* that the "*Patent Fire-preventive Plaster*" is a complete protection against the spreading of fire, in all the possible casualties of ordinary conflagrations.

Witnessed, as these experiments have been, by the highest and most competent authorities, it is perfectly futile for Colonel Macerone, at this time, to misrepresent the facts, or to underrate the value of the protective powers of the composition.

In order to show his intimate knowledge of the ingredients of which the fire-preventive plaster was composed, Colonel Macerone says, "I took a portion of it home, and found it to consist of Roman cement, size, and alum." The mode of chemical analysis by which the Colonel can resolve *one composition* into *another* must be a very singular process. Unfortunately, however, either for Colonel Macerone's honesty, or for his chemical skill, no such matters as Roman cement or alum enter into the composition of the article in question; and I am the more surprised at the temerity of Colonel Macerone, in venturing to put forth such mistatements upon this subject, because the actual components of this plaster are no secret. The specification of the patent, duly enrolled, gives the public free access to all the information they can desire upon this head. The basis of the fire-preventive cement or plaster is, *slate* and *calcined river sand*. The refuse pieces of slate are ground to a fine powder, and with the sand are boiled with a small quantity of tar, rosin, and the strongest glue, or other animal gelatinous substance. When brought to the required consistence, the mixture is dried, powdered, and packed in casks for sale. When required for use, it is tempered with water, as in mixing common mortar.

Colonel Macerone further states, that at the house in Dorset-street, *he saw* "the tubs of Roman cement, those of size, and others, which, not being opened, I cannot swear that they contained the alum." No such materials as Roman cement, size, or alum, were on the premises;* the "preventive cement" was delivered in *tubs* ready for use, requiring nothing but the addition of a proper quantity of water. Indeed it is necessary to mention, by way of caution to par-

* Surely if such ingredients composed the plaster, they would have been combined in the *manufacture*, not in the *using*!

ties using the preventive plaster, that *Roman cement*, if mixed with it, *spoils it.* Such a mixture greatly impairs its antiphlogistic powers, and never hardens properly; I have seen specimens which remained soft and friable, while the cement alone attained a stone-like hardness.

The determined hostility with which Colonel Macerone has all at once attacked the fire-preventive plaster—professing as he does, to be a fellow labourer in the cause of "fire prevention"—is most surprising. Nor will I pretend to explain the wherefore. Neither can the materials, of which the fire-preventive cement is composed, be of any very great consequence, so long as it retains the remarkable fire-resisting properties, which every trial has hitherto proved it to possess.

Without pursuing the subject further, I beg to remain,

Sir, yours respectfully.

Wm. Baddeley.

February 14, 1842.

MECHANICAL CHIMNEY SWEEPING.

Sir,—On reference to page 337, vol. ii., of your instructive Magazine, you will find fully described by G. W. T., with drawings, the first and best of the plans suggested by your correspondent, Mr. Emslie, in a recent Number. An improvement upon this plan I first made public in 1837, the object of which was to obviate the necessity of going on to the top of the house every time a chimney required cleaning. A model of my improvement is exhibited in the Polytechnic Institution, Regent-street, and may be described as follows:—Across the top of the chimney or chimney-pot, rather to one side, is placed a round bar of iron, over which runs a small *endless* chain, (jack-chain,) or incombustible rope, descending to the fire-place, where it passes under another round bar, placed in any convenient corner at the bottom of the chimney, to prevent the chain from twisting. A whalebone brush, or wisp of heath, &c., is to be attached to any part of the chain or rope, and by moving it up and down, it will effectually bring down all the soot, however crooked the chimney may be. This accomplished, detach the brush, clear away the soot out of the grate, and place the lower end of *the chain at the side of the chimney.* It will be necessary to have a chain or rope hung in each chimney. The only objection I can see to this plan is, that in the course of time the chain or rope will be apt, in rubbing against any acute angles, to work into the joints of the bricks, as chimneys are now constructed. To obviate this, I propose to insert in the chimney, where any very acute angle occurs, a metal brick, with one of its corners well rounded, which would form an easy surface for the chain or rope to pass over.

To all straight chimneys, the jointed rods, (Glass's machine,) are well adapted, and as one set will answer for many chimneys, they will on that account be found the most economical. If the above plan were generally adopted, it would only be necessary for adult sweeps to go about in the morning with brushes of two or three sizes to attach to the chain or rope, and a bag to carry away the soot.

Should you think the above worthy of insertion in your valuable Magazine, you will further oblige, Sir,

Your most obedient servant,

A. M'Gillivray.

38, Clarendon-square,
Feb. 1, 1842.

MECHANICAL CHIMNEY-SWEEPING — MR. EMSLIE IN REPLY TO MR. BADDELEY.

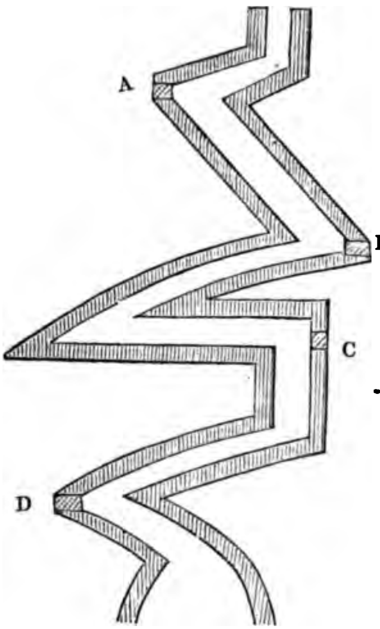
Newcastle-upon-Tyne,
Feb. 9, 1842.

Sir,—I feel assured you will do me the justice to give early insertion to a few words in reply to the strictures of Mr. Baddeley, on my plans for mechanical chimney-sweeping, published in your 964th Number.

I am, indeed, much obliged to Mr. Baddeley for giving me credit for motives of humanity in submitting these plans to the public; but, after showing himself so strenuously adverse to the employment of little children in the sweeping of chimneys, I think he might have left his mind open for the unprejudiced consideration of every variety of suggestion for the introduction of mechanical means, instead of so strenuously advocating one invention, to the exclusion of all others.

Could I have persuaded myself that Mr. Glass's machine was a perfect instrument for the purposes in question, I should not have troubled myself to devise new means. I uphold, however, and shall demonstrate this—that the *rope, weighted brush, pulley,* and *flue-door mode* is much superior to Mr. Glass's, in many instances. It is all very well for Mr. Baddeley to say, "There is no chimney in existence, capable of being swept

by the *weighted brush*, that could not be swept far better, and with less injury, by Glass's machines." But where is the proof of this? Mr. Baddeley cannot expect that the public will take his mere assertion of the thing as an absolute fact. I may with more reason, I think, ask—Can a single flue be pointed out, which Glass's machine is capable of cleansing, that the weighted brush mode is not equally able to effect? I am sure that all those who understand the respective properties of both methods, and are disinterested as to the success of either, will answer in the negative. Suppose the question reversed, what do we arrive at? Why, at this; that by numerous soot-doors the most perversely constructed chimney may, by Glass's machine, be swept; but that by many fewer contrivances, and much more easily, the same construction of chimney may be effectually cleaned by the weighted brush. The following sketch will illustrate the difference:—



A B C D are soot-doors, which I think Mr. Baddeley will allow would be required for sweeping a chimney of the intricate construction here represented, (I give it such a form for the sake of clearer illustration, though I should hope few such exist,) by means of the machine he so strongly advocates; whereas by using along with my suggested flue-doors and pulleys a long handled scraper, (evidently a more useful article for *cleansing horizontal flues than* a brush,) only the apertures A and C would be required. It is also apparent that the lodgement of soot which would take place at those parts of flues similar to that lettered E could not be removed by Glass's brush. A very great advantage likewise attending the pulley and rope is, that they can be made of very great use in the formation of a scaffold in the interior of the chimney, for the performing of any repairs therein.

Wishing every success to the "good cause,"

I am, Sir,
Obediently yours,
JAMES A. EMSLIE.

IMPROVED CANDLE HOLDER.

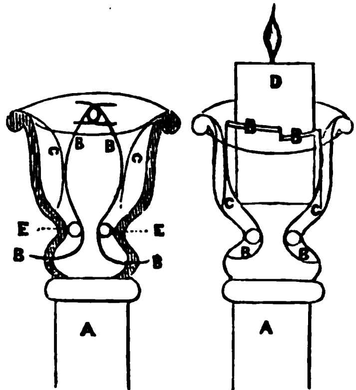


Fig. 1. Fig. 2.

Sir,—Should the above design for a candle holder be deemed worthy of a place in your valuable Magazine, it may be the means of preventing many a spot of grease from candles being awry in their sockets.

A, the candlestick.

B B, the candle holder.

C C, two springs on each side of the socket to keep the holder against the candle.

E E, two pins holding the candle holder in its position, and sufficiently loose to allow it to play.

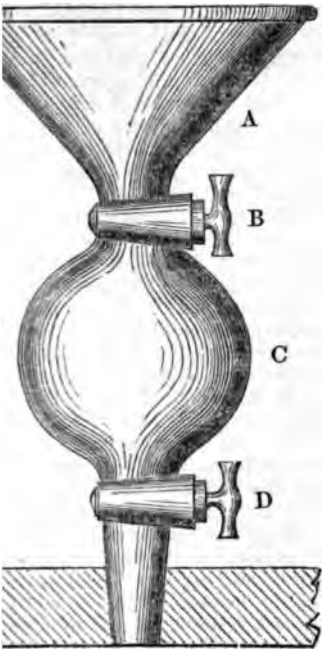
D, the candle.

Press with both fingers on the two lower ends of B B, protruding, as at fig. 1, which will open the holder to admit the candle being placed, as seen at fig. 2.

I remain, Sir,
Your obedient Servant,
J. B. B.

Guernsey, November 22, 1841.

IVED GREASE CUP FOR STEAM-ENGINES.



–A few days ago as I was viewing ration of a newly-erected steam- I thought proper to open the ı order to empty the grease cup : cylinder. But instead of doing ring the ascent of the piston, that n the space above the piston was unthinkingly did it during the ; the consequence was, that the lew out the contents of the grease- th very considerable force, and d them all over me. To save from being exposed to such ac- , I beg to suggest that the cup be formed in the manner repre- in the prefixed sketch. It will be le, previous to allowing the oil w to enter the cistern C, to ex- ne air therefrom, by closing the), when a vacuum will be pro- mmediately beneath: also to make tern C a little larger than A, in o preserve a small portion of air the tallow, after the cock B is the expansion of which would, ning the cock D, cause the oil or to leave the cistern more freely.

, *respectfully, yours, &c.*

Francis Harold.

BURSTING OF PIPES.

Sir,—In No. 966, Mr. Baddeley has given an account of the bursting of a pipe under peculiar circumstances, which he designates a "Singular Phenomenon." I was surprised that Mr. Baddeley, with his stock of general knowledge, should find the solution difficult.

My explanation is this:—That part of the pipe situated outside the house being colder than the portion which is inside, acted as a condenser to the vapour rising from the surface of the water in the shorter leg of the syphon. The vapour, as it became condensed upon the sides of the colder parts of the pipe, would descend to the stop-cock at the lower end, and would accumulate there. The frost would perform the remainder of the operation.

By the rising and falling of the water in the cistern, and consequently, in the shorter leg of the syphon, the inclosed air would be alternately compressed and dilated, which would increase the evaporation, as the variable density of the air would give it different capacities for retaining the aqueous vapour; and, by the falling of the water in the shorter leg, the sides of the pipe would be left wet, and thus the evaporating surface would be much increased, forming a complete distilling apparatus upon a small scale. It may be asked, why the pipe should burst at a distance of 9 inches above the cock? The answer would be, that the water is supposed to have stood at that height, and the upper surface becoming frozen first, would strain the pipe in that part, and the condensation still going on, would cause the ice to accumulate there and complete the fracture.

If this view of the case should be deemed satisfactory, perhaps it may assist in the explanation of the bursting of gas pipes, for they are subject to accumulations of a fluid, more or less watery, in the lower situations, and are liable at times to be frozen.

Yours respectfully,

T. Claxton.

29, Harrington-street North, Hampstead-road, February 14, 1842.

[Somewhat similar explanations have been furnished by S. E. A., and An Old Subscriber.—Ed. M. M.]

PNEUMATIC RAILWAY BUFFERS.

Sir,—Seeing in the *Mechanics' Magazine* for December 1841, a letter from our talented townsman, Mr. Robert Mallet, explaining the particulars of what he calls *his Hydro-pneumatic Buffer*, I beg leave to offer a few remarks on the subject. Having peculiar opportunities of witnessing several experiments, and having paid particular attention to his buffer while in use, I can state that the piston, or buffer bar, when forced towards one end—which could only be by violent concussion—never reacted so as to adjust itself in the position before struck at the centre. This was one great fault, and I believe the principal cause why it was so soon abandoned. Another defect was the awkward position of the buffing cylinders as regards the rail on which it was placed, as the two air vessels stood above the bottom boards, and inconveniently monopolized a portion of the space intended for the accommodation of passengers' feet. Altogether it was much too large and heavy, and offered an unnecessarily rigid and very unpleasant resistance to all ordinary shocks, such as the stopping or starting of the train. When placed alone on the railway, and struck with any heavier moving body, the buffer scarcely acted except as a rigid bar, because the power requisite to overcome the *traction* of a light coach (such as the one in which it was placed, which might be moved by a force of from ten to fourteen pounds,) was incalculably less than that required to compress such a body of air, with the additional resistance from friction of the buffer bar at each end, the two stuffing boxes, and heavy centre piston unsupported for 6 or 8 feet. The only time the buffer might be said to act from the effect of an ordinary shock, was when the cylinder was minus a portion of the water, which was constantly oozing out at the stuffing-boxes, at which time, if struck, it would sluggishly move forward till relieved, and then react through a portion of the space before traversed, but so slowly as to be scarcely perceptible —a defect which must have been owing to one of two causes, the resistance to the friction above mentioned, or the escape of water over or around the centre piston.

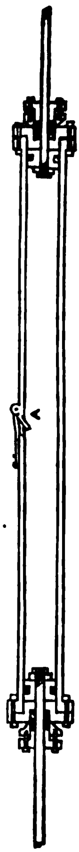
I have no doubt this buffer may be so modified as to resist the shock of a train, *if fixed at the terminus* of a railway; or for a heavy locomotive engine, if the attendants were very assiduous, and sufficiently philosophic, so to ascertain the exact amount of unknown quantities, as to know when the injected air would be of equal density at either end. The adoption of such a system of buffers would, however, be the means of providing employment for many persons more than are ordinarily required.

There is one paragraph at the conclusion of Mr. Mallet's letter, (page 420,) to which I shall briefly allude. Mr. M. says, "This buffer continued in use a long time upon the Dublin and Kingston railway—as long, I believe, as the under carriage lasted—and at length fell into disuse from neglect, as standing isolated in the midst of a different buffing system." The "long time in use" was, on an average, part of one day in each week, for a few months, and then only in cases of the greatest necessity, on account of the extra weight of the coach, and rigidity of the buffer; the "carriage" in which it was fixed is still in daily use, since the *Hydro-pneumatic buffer* was removed at the desire of the person who employed Mr. M. to have it made; and as to its being "in the midst of a different buffing system," it was so only in *form*, not in *system*, as it is stated in a former page to be on "the same system of thorough buffing as that invented by Mr. Bergin."

But to pass on to what Mr. Mallet considers an improvement in the application of these buffers for railway use in general, namely, the scheme of placing a buffer "in the thickness of the roof of a railway coach." Certainly this is a perfectly novel and original idea; but I fear the application of it would be practically defective, as it would be found difficult so to frame a coach-*body*, as to have the roof sufficiently strong to resist any considerable shock. Making use of the roof as a place of resistance would indeed be using a destructive lever of the first order to crush the *coach-body*, as the pillars—technically so called—have little or no other support but at the bottom, into which they are, and must in all cases be framed. I also fear Mr. M. has fallen into error respecting the point in which the centre of gravity of a railway coach is situate, as the wheels, axles, and bearing springs are, in all cases, at least of equal weight with the body, and the buffers are gene-

d on the upper side of the *car-* ch is in all cases very heavy; tly, the line in which the centre falls must be somewhere under of the buffers, in every car- onstructed; for which reason I from much experience, that in s out of ten, whatever be the the collision to a railway train, es are never totally upset. I vn instances of the breaking of in no case did the carriage ever 'er; and of one wheel breaking ments, and yet the coach re- n the other three. In conclu- uld say, that if the roof buffer ed to be at all practically useful, o be equal in size and strength in the under carriage, as work- onjunction with them; but as it nended to be smaller, and con- weaker, and as "partial weak- he weakness of the whole," it presume, on that ground alone ionable.

year 1835, I proposed to have a compress air at atmospheric in a cylinder, as a simple sub- r railway coach buffers. I con- that as the compression would times momentary, there would cape of air of any consequence ot effective working, with or- vell-packed stuffing boxes. The whom I proposed this plan, ely employed Mr. Mallet, of to have one made, allowing him ve on my suggestion; the result was—in order to overcome an y defect — the use of water, to he escape of air, as if the pres- intended to be uniformly con- and not momentary, as in every ut what I considered a decided nent on the experimental one, h would prevent the necessity of in air or water at any time, the plan, of which the following a longitudinal section. This cylinder is intended to be of iron, or coarse brass, 6 feet in and about 4 inches in diameter, separate pistons, and an ordinary ox at each end, through which n rods, or buffer bars, continue he ends of the carriage, to receive r heads; on the top of the cy- the centre, is placed two small *alves—one within the other—* the inner to open inwards at all times when at rest; the other, or rather both, to open a small portion outwards against a small stiff spring, proportioned to resist all ordinary concussions; this latter to act as a safety-valve to prevent the explosion of the cylinder, should the pistons



be forced together by any extraordinary shock, or collision: from this it must appear evident, that as at all times the approximation of the pistons towards each other would be momentary, there would be a partial, or nearly perfect vacuum between them and the stuffing boxes, which, acting in conjunction with the rarified air in the centre, and ultimately, the ingress of atmospheric pressure at the valve, would altogether, when re-

lieved from a blow, cause the pistons to collapse, and be ever ready to offer a perfectly elastic, and very appropriate resistance for railway carriages. Instead of the valves, a small hole in the centre of the cylinder may answer for ordinary use.

E. Heydn.

Dublin, February 14, 1842.

THE LITTLE WESTERN.

Sir,—In your last Number, (966,) there is a paragraph copied from the *Times*, respecting the performance of the *Little Western* steam-boat. It is there stated that "she was accompanied down the river by one of the fastest boats, viz., the *Railway*, for which she waited off Galleons, and with which she contested, head and head, to Gravesend." Now, I do not wish in any way to depreciate the powers of the *Little Western*, being, as they profess her to be, the best boat that has been turned out from the western districts; but at the same time I must say, that had the advocates for Bristol boats and machinery been more candid in their representation of facts, it would have been much more to their credit. That the two boats went *head and head* into Gravesend, I do not for one moment dispute; but they must remember, that, after the fair start off Galleons, the *Railway* kept gaining, and it was not until a stoppage at Purfleet, where the had to land five passengers, (four la one gentleman,) that the *Little* came up to her, and, from the wel attraction of two boats in close ju tion, the *Railway* could not get aw her opponent before their arrival at end; so much for the *head and hea* as it is represented.

It is much to be regretted that, ir ports of the performances of steam-b mention is made of the fuel expende I have ascertained from the most s sources, that the fuel consumed in t *way* is about six hundred weight a quarters per hour, being at the rate *eight pounds per horse power pe* while the rumoured consumption *Little Western* is thirty-three weight, being at the rate of about *three pounds per horse power p* Now, if this be true, (and if not, contradict it, and say what it reall taking the expenditure of fuel at onl that of the *Railway*, surely *conveni rapidity* must be very *imperative* ir induce speculators to supply the pu them at such a rate. If this is all t don engineers have to compete wi task is indeed easy.

I am, Sir, yours, &c.,

X. Y. Z., (passenger per *R*

London, Feb. 15, 1842.

MESSRS. PALMER AND PERKINS'S PATENT PUMP.

Derby, February

Sir,—I have attentively perused Messrs. Palmer and Perkins's description, in No. 963, of what they are pleased to style an improvement on that "most important," but much abused article, the *common pump*. If their pump be so efficient as they allege, will you permit me to ask why they have drawn it with so short a suction-pipe? It is quite ridiculous to talk of testing the capabilities of such a machine for mining purposes with a five, or even fifteen feet lift. Again, as to their wonder-working valves — were they *simply discs* "cut diagonally out o cylinder of the same diameter as th the pump-barrel," there could be n that, at the proper angle, they wo the barrel with the greatest accura doing so, it would be impossible th work on their spindles: and to ena to take the position of the open shown in fig. 3 of Messrs. Palmer kins's drawings, the disc must be nearly $\frac{3}{16}$ths of an inch on each set out in the subjoined diagram f

inch pump. A *wonderfully efficacious* method, this, of rendering them fit for retaining liquids, gases, and steam! With respect to *the trial at Mr. Robinson's*, it proves, in my judgment, nothing beyond the fa which plausibly described experim be made to fit and (apparently) to co almost any sort of foregone conclu

great bungler who could not as e shown the packed piston to be with double the amount of friction to it. No, no. Comparative ex-, by all means; but let them be iments, conducted by, or in the of, competent and disinterested

I am, Sir, yours respectfully,
TREBOR VALENTINE.

S CONDENSING CYLINDER ENGINE.

must again intrude upon your and solicit space enough in an iber of your Magazine to thank ible correspondent, "Scalpel," for ıanner in which he has spoken of . I doubted not, judging from and the interesting papers which nated from him, but that such the case, whether for or against.

el" is the first, I think, of your lents who has had temerity or good ıough to pronounce *decidedly* in my invention, but I fear not that long, will join him.

ıt justice, perhaps, to myself, that t the same time inform "Scalpel," riendly suggestion of "increasing of the condensing cylinder" was ıe many months ago, and that the n the hands of the manufacturers so; not that I apprehended any nd that the piston, when discharg- ondensement, travelled any faster rdinary air-pump bucket, the steam velling at the usual speed; but, whole, there were advantages to be om such an arrangement, and it ometimes, the prejudice of those I the subject.

I am, Sir,
Your obliged servant,
JAMES PILBROW.

n-green, Feb. 12, 1842.

PATENTS—DEFECTIVE SPECIFICA- TIONS.

Queen's Bench, Westminster, Feb. Sittings at Nisi Prius, before Lord and a Special Jury.)

The Queen v. *Nickels.*

s a *scire facias* to repeal a patent been taken out in respect to the ıachine to which the defendant had additions and improvements.

icitor-General, Mr. Erle, and *Mr. h*, appeared for the Crown; the *General, Mr. M. D. Hill*, and *Mr.* or the defendants.

The *Solicitor-General*, before entering upon the merits of the invention, submitted to the Court that it would be a mere waste of time to call any witnesses, or enter into any inquiry about the circumstances of the case, as the specification upon which the patent had been founded was illegal and void. The patent was for *additions to* and *improvements in* a machine already in existence; and it was a fundamental principle of the patent law, that in such cases the specification should clearly and precisely define the part of the machinery to which the patent was applied. Without such a statement, it would be obviously impossible for the public to know what part of the machinery they were prevented from using during the period for which the patent was to run. The learned gentleman further contended, that the specification did not so describe the nature and construction of the invention itself, as that any person in the same trade could make and apply it as soon as the period for which the invention was protected by the patent should have come to a termination. As the specification was therefore illegal with respect to the two capital objects for which every such document was required by law, it became altogether unnecessary to enter into the other parts of the case.

The *Attorney-General*, on the part of the defendant, submitted that any intelligent workman connected with this particular business could see, with the help of the drawing annexed to the specification, what part of the machinery was new, and what was old; and the learned gentleman proposed to give evidence to that effect.

Lord Denman, however, was clearly of opinion that the material parts of the specification were inadequate when taken severally, and inconsistent when taken together. Such being the character of the specification, his lordship was of opinion that it would be a mere waste of the public time to hear any evidence upon the subject; and his lordship directed the jury, therefore, to return a verdict for the Crown.

The *Attorney-General* then tendered a bill of exceptions, which was received.

Court of Queen's Bench, Westminster, Feb. 14.—(Sittings at Nisi Prius, before Mr. Justice Wightman and a Special Jury.)

Cooke v. *Pearce and others.*

This was an action for the infringement of a patent which the plaintiff had taken out for an improved method of working what are called "German windows," in barouches and other carriages of that nature to which windows of that sort are applicable.

The *Attorney-General*, (with *Mr. Hoggins*,) appeared for the plaintiff, and called

witnesses, who proved that the method and machinery in question were highly useful and advantageous to the public, within the range in which it could be applied, and that the plaintiff was the first person that had so applied it.

Mr. Erle, (with *Mr. H. Hill*,) appeared for the defendants, and submitted, *first*, that the improvement in question was not the proper subject of a patent at all, as it consisted merely, or principally, in the application to the window of springs, the nature and quality of which were perfectly well known to the public for a very long period of time; *second*, that the specification did not describe with sufficient accuracy the nature of the invention, for that the old and new parts were not properly distinguished from each other; and, *third*, that in stating that the invention was applicable to carriages, the patentee claimed too much, for that it was not applicable to chariots and close carriages, and the patent having claimed more than could be supported, the patent became void on that account.

A great deal of discussion arose upon these objections, and it was ultimately agreed between all parties to put certain facts upon the record in the shape of a special verdict, upon which the judgment of the Court above is to be taken upon a future occasion.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

William Edward Newton, Chancery-lane, Civil Engineer, *for improvements in the manufacture of fuel.* (A communication.) Petty Bag Office, January 7, 1842.

This fuel, to which the name of "Carboleine" is given, is thus produced. A quantity of coal, charcoal, coke, brown coals, or peat coals, being reduced to a fine powder, is put into wooden tubs and mixed with oil; two and a half parts of water, to one of clay or loam, are then added, and the mass worked into cakes by hand or machinery. These cakes being afterwards gradually dried, by the application of fire-heat, become nearly as hard as stone, and in burning are said to give out more heat than any other known combustible.

Should a fuel capable of producing a still more intense heat be required, oil and fluid tar are combined with powdered coke and coals. The proportions of the ingredients for three qualities of carboleine are given as follows:—

No. 1. Twenty-four parts coal, six or seven of clay water, one of oil, and one of bitumen.

No. 2. Twenty-four parts coal, six or seven of clay-water, and two of oil.

No. 3. Forty parts of coal, thirty-six of clay-water, and four of oil.

Joseph Ratcliffe, of Birmingham, Manufacturer, *for certain improvements in the construction and manufacture of hinges for hanging and closing doors.* Enrolment Office, February 3, 1842.

A lever, to be screwed or otherwise attached to the under side of the door, is mounted on the square head of a vertical axis, the upper end of which is supported in the brass cover, while its lower end works in a cylindrical cavity of the cast-iron box within which the mechanism is placed. Near the lower end of the axis a segmental plane is affixed, with its upper surface inclined to an angle of about 70°. Within the box, and turning on a horizontal axis, is placed a broad lever, at the end of which there are two small rollers, disposed at such a distance asunder as to rest upon the two edges of the segmental plane; from this lever, immediately over the horizontal axis, rise two arms or levers, at right angles with the former, carrying between them a swivel nut, stepped to form abutments for two strong helical springs placed one within the other. This part of the mechanism is screwed down into the cast-iron box which forms the base of the hinge, in such a position, that the two small rollers rest one on each side of the inclined segmental plane. At the back part of the box there is a metal plate, carrying a screwed pin, upon which a stepped nut is mounted, opposite to the swivel just before described. Between these nuts two strong spiral springs are placed, the pressure of which can be adjusted by screwing backward or forward the hindmost nut, four holes being made in its circumference to admit a lever for that purpose. On opening the door to which this apparatus is applied, the inclined segmental plane is brought under one of the rollers and raises the broad lever, which pushes back the swivel nut and compresses the spiral springs; the reaction of these springs upon the inclined plane turns the axis, and closes the door.

The claim is, 1. To the general arrangement of the parts of a door-hinge, as described and illustrated; 2. The use of the swivel nut for receiving and transmitting the pressure of the springs to the levers.

John Lee, of Newcastle-upon-Tyne, Manufacturing Chemist, *for improvements in the manufacture of chlorine.* Enrolment Office, February 4, 1842.

These improvements consist in manufacturing chlorine by the use of retorts or ovens, which are so arranged as to have the heat required for the process transmitted downwards, through the covering or arch of the oven or retort. In the drawing accompanying the

m, three retorts or ovens are heated by the fire of one furnace; e chambers is covered by an arch, h the furnace flue is led, so that may be transmitted downward, he arches, to the materials placed : chambers. In each chamber there h of stone, such as is used for the 's and flues of alkali works; or the ıay be made of fire-clay, moulded 'equired shape. One side of each is furnished with a leaden door, and posite side there is a pipe of lead, ıware, for the escape of the chlorine. being kindled, and the chambers ly heated, lumps of manganese are the troughs, and the doors closed; acid is then introduced through es, conveniently placed for that pur- d the chlorine is given off. The of manganese is drawn off from the on the completion of the process, s of syphons.

laim is, 1. To the mode of manufac- ılorine by the use of retorts or ovens, ged as to have the heat required for :ess transmitted downward, through ring or arch of the retort; 2. To the constructing the troughs or bottoms or chambers for evolving chlorine e heat is used below, or at the sides, , each of one piece of stone, or l fire-clay, as described.

SEAWARD AND SAMUEL SEAWARD, CANAL IRON-WORKS, POPLAR, EN- s, *for certain improvements in steam-* Enrolment Office, February 10,

improvements comprehended under ent are divided into four branches. t comprehends various new modes of ing and disconnecting the paddle- f marine steam-engines. The second of an addition to the ordinary air- ucket of steam-vessels of a sort of ttom, which, by excluding the water r ordinarily collects at the bottom of ıp, facilitates the escape of the un- ed vapour and gases, and thus helps luce a more perfect vacuum. The anch embraces several modes of dis- g, at regular intervals, and in duly ioned quantities, the brine, or satu- r foul water, from marine steam- oilers. And the fourth consists of a ing and distilling apparatus, (super- entirely the ordinary condenser,) by he spent steam of the working cylin- previous to its condensation, made to n obtaining by distillation a con- upply of fresh water. By adopting illing part only of this apparatus, it *used in connection with a condenser ommon form.*

SAMUEL BROWN, OF GRAVEL-LANE, SOUTHWARK, ENGINEER, *for improvements in the manufacture of metallic casks or vessels, and in tinning or zincing metal for such and other purposes.* Enrolment Office, February 11, 1842.

The improvement "in the manufacture" consists in a mode of fixing the heads and ends of metal casks and other vessels by means of tinning or soldering. The metal of which the cask is made having been previously tinned, the head is slightly forced into its place, and having been dipped into powdered rosin, is held by a suitable apparatus, and lowered into a shallow vessel containing melted tin, in which it is kept immersed for five or ten minutes. In some cases a hoop is driven on to the end of the cask, and fixed by the tinning process at the same time as the head.

The improvement "in tinning, or zincing" sheets of metal consists in the employment of a hot plate on which the coated metal is laid after tinning or zincing (which is conducted in the usual manner,) while the superfluous metal is wiped off its surface.

The claim is—1, To the mode of fixing the heads or ends of casks or other vessels, by immersing the ends of such vessels in a bath of suitable melted metal, as above described.

2. To the mode of keeping sheets of metal heated (in order to the superfluous coating metal being removed) by the application of a hot plate, as described.

WILLIAM HALE, ENGINEER, AND EDWARD DELL, MERCHANT, *both of Woolwich, for improvements in cases and magazines for gunpowder.* Enrolment Office, February 12, 1842.

These improvements consist in the construction of covered cases and magazines for gunpowder of cast or wrought tin, whereby cases containing gunpowder will not be chemically-injuriously acted on by the powder.

These cases are made six-sided, so as to possess considerable strength, and at the same time, to allow of a number of them being packed closely together. On the top there is a cylindrical neck, on which a male screw is cut or formed, blanks or spaces being cut in three equidistant parts, to admit corresponding projections on the inside female screw of the cover to enter. The cover is held to the case by a quadrant-shaped bolt or pin, which prevents its being detached when the case is opened. On the inside of the cover is placed a leather or other washer, so that on placing the cover in its place, and turning it partly round, a close joint is made. These cases may be cast in moulds of either sand or metal, or they may be made of wrought tin soldered up. By this means,

say the patentees, a covered case or magazine of any required size may be made, which, from the peculiar character of the metal, will retain gunpowder with great safety, and without the metal of which it is composed being prejudicially acted upon by the chemical properties of the gunpowder.

The patentees state that they do not confine themselves to the form, or to the mode of fixing the cover, both of which may be varied, nor do they confine themselves to the exclusive use of tin. But they consider tin, in an unalloyed state, to be best adapted for this purpose.

NOTES AND NOTICES.

Pearl Fisheries of Ceylon.—The principal pearl fishery in Ceylon is that off Aripo, where the oysters lie in from five and a half to seven fathoms water, protected on the west and south-west by a ridge of sand and coral; this ridge is considered by the natives to be a submerged island, but it is generally believed to be a rising bank of coral and sand. The age of the oyster, at its separation from the rock, is stated by an intelligent diver to be six years and a half; the pearls are found in all parts of the fish; as many as sixty-seven have been found in one oyster; they are not generally found in those oysters that would be considered the finest for eating, which favours the idea that pearls are produced by disease in the fish. A single diver will generally bring up in a day from 1000 to 4000 oysters; the fishing takes place in March.

Gold-Dust.—The St. Petersburgh papers state that an important discovery has been made by the expedition sent in search of deposits of sand containing gold. It consists of a bed of sand, near the source of the Nadejoni, not far from the washing station called Pesaskoi Tersinski; it is estimated to contain 100,000 lbs. of sand, and, to produce 3 pouds 9 punds 16 zols of gold. In the essays already made 4 punds 60 zols of metal, rich in quality have been extracted. The poud is rather more than 40lbs. English.

Progress of Rust.—M. Montgolfier, jun., having learned that a grating of iron wire from the church of St. Martin's, at Paris, was about being taken down, after having remained forty years without any repair, had the curiosity to prove these wires, after having carefully ascertained their number, and he was convinced that they had lost but one fifth of their entire strength. The increase of oxidation is not as rapid as might be supposed, for the first layer of rust which covers the surface of a bar of iron, instead of favouring this oxidation, proves a coating which is an obstacle to it.

Steam Navigation of the Indus.—A correspondent, on whom we can rely, has favoured us with some interesting information as to the navigation of the Indus, and the British craft now on it. Sir Alexander Burnes had thought that a vessel of four feet water might always ascend it in safety; but it is found, by experience, that one drawing more than three feet water is useless, from the perpetual shifting of the river's bed and channel, and the peculiar formation of its bars. Vessels of that draught have ascended to Loodieana on the Sutledge, and could reach Kalabagh on the Attock branch: the Rava branch is navigable to Lahore; and the Cheenab is believed to be navigable to a considerable distance from its junction with the main stream near Moultaun. There are at present only three steam-vessels, all of iron, on the Indus—the Comet, Planet, and Satellite; the first of forty-horse, the others of sixty-horse power. They draw thirty-six inches of water. A smaller vessel, the Meteor, is under repair at Bombay. Two of the Euphrates steamers, of fifty and forty-horse power, have been ordered to Bombay, most probably for the Indus. The communication between Bombay and Kunatchee is kept open by the Indus steamer; but it draws too much water for the river.—*Spectator.*

India-rubber Welted Hose.—The making of this description of hose is rapidly extending in France; from some astonishing cause, the few attempts made in Nottingham have not succeeded. We believe the causes are—first, that the English web is deficient in the number of warp-threads; secondly, that the web is stretched too far on the needles; thirdly, that the weavers do not turn the welt down over the stocking, which increases the comfort to the wearer; and, lastly, that the hose and half-hose are not made that extra length to allow for such turning down. We speak for ourselves when we say that, having worn stockings with India-rubber welts, nothing can excel their comfort, as they act as an elastic garter, without the trouble of buckling and unbuckling, and wholly prevent that most unpleasant circumstance—the stockings coming down about the heels of the wearer. The India-rubber will wash, but it is rather injured by long boiling. Always anxious for the good of the English hosier, we advise them that French India-rubber welted hose have made their appearance in London; we saw large quantities in Paris, in September last.—*Nottingham Journal.*

Sheathing Steam-boilers with Lead.—A correspondent of the Mining Journal states that, at a manufactory in Newcastle-on-Tyne, the boilers have been cased with sheet-lead, one-eighteenth of an inch in thickness, and weighing four pounds to the foot; and that the amount of the radiated heat is thus so much diminished, as to be equal to a saving of 17 per cent. in fuel. "The average consumption of coal, by these boilers, previous to the adoption of this plan, was 60 cwt. per day, but now 50 cwt. is found to be amply sufficient; therefore a positive advantage is obtained of 10 cwt. per day, which is one-sixth, or 17 per cent."

Iron Wire Rigging.—A vessel, "the *Marshall of Grimsby,*" is now in the river off Hermitage Stairs, the rigging of which is all of wire, (Smith's patent wire rope). It has been nearly six years thus fitted up, and the rigging is stated to be nearly as good as new.—Taking a 3-inch wire rope, and comparing its size, weight, and cost with hempen rope, or chain, of equal strength, the results are found to be—

A 3-inch patent wire rope, weight $6\frac{3}{4}$ lbs. per fathom; hemp rope, of 8 inches, $14\frac{1}{2}$ lbs.; and $\frac{11}{16}$ chain, 36 lbs.—equal to a strain of 16 tons. The comparative cost being—3 inch wire rope, 3s. 8d. per fathom; 8 inch hempen rope, 6s. 3d.; and $\frac{11}{16}$ chain, 7s. 6d. per fathom.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 968.] SATURDAY, FEBRUARY 26, 1842. [Price 3*d.*

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THE HADDINGTON MARINE STEAM-ENGINE.

Fig. 1.

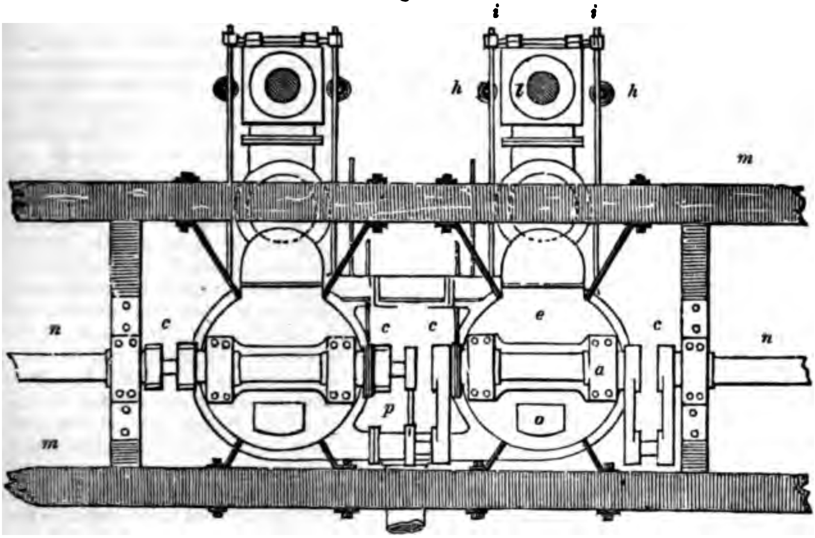
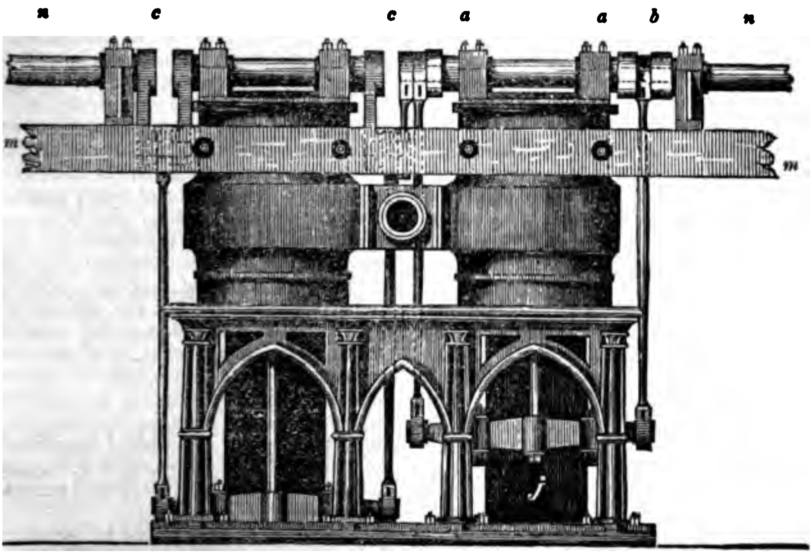


Fig. 2.



DESCRIPTION OF THE HADDINGTON MARINE STEAM-ENGINE. BY THE INVENTOR.

The marine steam-engine about to be described was modelled for the first time at the request of Mr. George Rennie, and examined by Mr. Lloyd, at Woolwich, by order of the Admiralty, in May, 1841. At that time, the method of connecting two engines on the principle shown by the model was not explained, and Mr. Lloyd considered an intermediate shaft would be necessary, with a greater length of hatchway across the deck of the vessel than he approved of, or than was, perhaps, convenient. Since then, however, I have devised connecting the engines by a single *link*, which is simple, and, from its accommodating nature, well suited to marine engines having foundations, at best deficient of rigidity. This mode of connection is shown by the accompanying drawings, and its action was clearly defined by a second model that was submitted to the notice of the Admiralty.

Mr. Lloyd also objected to the apparent inconvenience there might be in keeping the packing tight round the piston-rod, from the stuffing-box being below the cylinder, and the screws which compress the packing less accessible than when placed above the cylinder in the ordinary way. This defect has also been removed by substituting a weight and lever for the screws, making, in fact, the stuffing-box self-adjusting, and thereby avoiding the trouble of screwing it up. The piston-rod is lubricated from an external chamber by an induction-pipe, and the same method is used to lubricate the piston-rod of the slide-valve.

By my arrangement for marine engines, the crank-shaft is placed upon the top of the cylinder, which is inverted, and requires to be removed when the cylinder cover is taken off. To some individuals this has appeared a serious matter; with me it has little or no weight. Having placed a man-hole in the cover, the trouble of removing either the cover or crank-shaft will be avoided, unless the piston or piston-rod should want a thorough repair. By the present mode of managing marine engines, there is no such convenience, and the cylinder cover is always removed when the engineer thinks it necessary to have a peep at the inside.

When Mr. Lloyd inspected the model that was made at Messrs. Rennie's, he informed me it would be considered with reference to the most improved engines in Her Majesty's service, namely, the *Gorgon* engines, and those of Messrs. Maudslay and Field's invention, and not the old engines with side levers. As respects Messrs. Maudslay and Field's engines, the comparison would be quite fair; they have the advantage of a long stroke and long connecting-rod, and are contained in much less space than engines having side levers, which are the very advantages aimed at in my design; whereas, in the *Gorgon* engines, neither the one nor the other is considered.

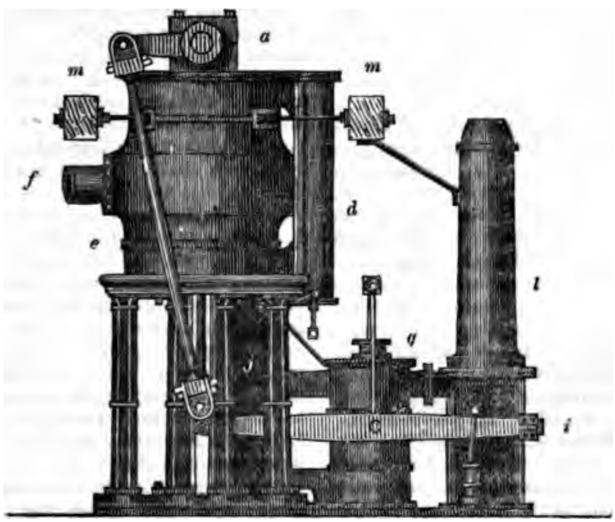
In effecting this improvement, Messrs. Maudslay and Field have been compelled to divide the cylinder into two parts; and by placing one of them a little distance from the other, space is afforded for the connecting-rod to vibrate between them, by means of a T-formed cross head. The top connects the piston-rods of the separated halves, (as a matter of course,) formed into cylinders, and the leg drops between them, and gives motion to the connecting-rod from a joint at the end. The plan is highly ingenious, but whether separated pistons, working in separated cylinders, connected by a cross head of the above form, is not more liable to derangement than the single cylinder, in the position I have placed it, remains to be proved. What the space which Messrs. Maudslay and Field's engines occupy, and their cost, may be, in comparison with mine, there is nothing to show, but I think the advantage would be on my side.

From the arrangement of a *Gorgon* engine, as it is termed, the stroke of the engine and connecting-rod is unavoidably short. The stroke of every engine being double the length of the lever or crank which it turns, it follows that the paddle-wheels of these engines must be driven by a *reduced leverage power*. To make good this defect, the cylinder of the engine is enlarged, and the velocity of the piston is impeded, to economise the steam. To obtain adequate results from such an arrangement, the force of the steam power must be increased in proportion to the diminished length of the crank: this is easily effected, but its evil consequences are, perhaps, not so easily avoided.

If two engines were placed in the same

but not connected, so that each drive its own paddle-wheel, and them were 100 horses power, with t stroke, and the piston travelling ate of 200 feet per minute, while er had a stroke of 4 feet, with the travelling at the rate of 133 feet iute, the latter must exert a force crank-pin equal to that of 150 power engine to be a match for mer. Both paddle-wheels would ake the same number of revolu- but the immense difference be- he forces employed to effect this eatly to the strain on the crank- the short-stroked engine, and to tion on the brasses of the connect-ing-rod, and the bearings of the crank shaft. The circumstance of impeding the velocity of the piston only serves to economise the steam, but in no respect lessens the strain on any of the moving parts of the engine which are employed in conveying the motive power to the crank shaft. Neither can it lessen the strain on the framing of the engine, or ship, but substitutes, as it were, an engine of 150 horses power to perform the labour which can be done by another of 100 horses power, the piston of the former travelling at the rate of 133 feet per minute, and that of the latter at 200 feet.

Fig. 3.



usual way to determine what should length of a connecting-rod of an , is by the length of the crank it With land engines it is generally six times the length of the crank; case of marine engines with side somewhat less than five; and with ort-stroked Gorgon engines, only A connecting-rod only three times ngth of the crank lies in a very direction when the crank is in sition of communicating its greatest to turn the paddle-wheels; conse- y, acting with more friction and ect at that important portion of the revolution when the paddle-wheels feel the force that propels them in the highest degree. As the crank moves round from its extreme leverage, the length of the connecting-rod may be said to be virtually increasing, but the proportion of 3 to 1, in my opinion is much too short when the crank is at right angles to the piston-rod, and in the position described as respects its effect on the paddle-wheels. From this view of the subject two evils are combined in the arrangement of the Gorgon engines. One is, the introduction of a much greater mechanical force to propel the paddle-wheels than is necessary; and the other, losing the full advantage of the crank's

leverage when at the greatest. The former is consequent on a short stroke, and the latter, on a short connecting-rod. In carrying out the principle to an extreme, either jointly or separately, the same result takes place, namely, a total destruction of the whole mechanical energy by friction. On the other hand, let the long stroke and long connecting-rod be extended to the utmost limits of man's capability, and we shall still have an engine that will work effectually, although the proportions be in an inverted form.

Having ventured to give an opinion on the principle which has for its basis the application of a short leverage with an increase of power to the purpose of driving paddle-wheels, I shall now proceed with a description of the accompanying drawings of the Haddington Engines, differently framed since they were presented to the notice of the Lords Commissioners of the Admiralty.

Fig. 1 is a plan; fig. 2, an end elevation, showing two engines connected by a single link; and fig. 3, a side elevation of one of them. *a*, plumber-block of crank-shaft; *b*, top of connecting-rod and-crank pin; *c*, crank; *d*, valve-case of cylinder; *e*, cylinder; *f*, steam-pipe; *g*, air-pump; *h*, force-pump; *i*, levers for driving pumps, worked by the cross-head of the engine; *j*, condenser; and *l*, hot-well. *m*, *m*, strong wood framing athwart the ship for supporting the plumber-blocks of paddle-shafts, (see figs. 1 and 2) and *n*, *n*, paddle-shafts. From this frame strong iron stays are extended to the cylinders; and in fig. 3, one is shown extended to the hot-well; *l*, *o*, man-hole to cylinder; and *p*, the connecting link alluded to in the former part of this communication.

By this arrangement, the space occupied by the engine is reduced 46 per cent. in comparison with engines having side levers on the old plan, and the difference affords room for stowing about 100 tons of more coals in a vessel requiring engines of 200 horses power, and, as a matter of course, with vessels requiring engines of greater power, a similar advantage will be obtained. It might still be greater were the condenser, air-pump, and hot-well brought closer together, but the engine-room already is reduced to 17 feet 6 inches long, by 16 feet 10 inches wide, and it must not be forgotten that the cylinders will throw off an equal quantity of radiating heat, and too much contraction would make the engine-room unhealthy.

If fig. 3, be turned upside down and the cylinder of the engine supposed to be fixed upon the floor of the vessel in the ordinary way, then by the plan before us, the connecting-rods *b*, at the same stage of construction as respects the moving parts, effect a rotary motion on the crank-shaft, which, with engines on the old plan, have only arrived at the length of vibrating the ends of two immense cast-iron lever beams; and these beams communicate the power to a third connecting rod, nearly as heavy as the other two; which, in its turn conveys the force to the crank shaft. By this comparison, the simplicity of the Haddington engines is made to appear most distinctly. Again, if the connecting rods *b*, be turned the reverse way, and the crank shaft supposed to be elevated a proper height to be driven by them, then the arrangement would be similar to that of a Gorgon engine, and the crank shaft 7 feet 6 inches higher than what it is; but this not being admissible in a steam vessel, the alternative heretofore explained has been adopted.

The connecting link *p*, offers an advantage to a steam frigate distinct from its accommodating nature as a mode of connection between two engines. For example, previous to an engagement, it may be removed in the short space of ten minutes; the paddle wheels would then be driven by their respective engines, and by giving the rudder of the ship power to act on the throttle-valves of the engines, the velocity of either paddle might be impeded to suit the movement of the vessel, which would give great facility in bringing her about. This, perhaps might be carrying the improvement too far, and the purpose might be answered equally well by the throttle-valves being operated on by hand from the deck. There can be no question about my engines working separately, as well as jointly, and by the plan suggested being adopted on such occasions, the danger of the one engine breaking down the other, in the event of a shot disabling either, would be avoided.

James White.

11, East-place, Lambeth, and Haddington, N.B.
February, 1842.

OF THE COMPARATIVE MERITS AND DEMERITS OF THE THREE DIFFERENT
S FOR THE PROPELLING OF STEAM-VESSELS, VIZ., PADDLE-WHEELS, THE
MEDEAN SCREW, AND A NEWLY-DISCOVERED PROPELLER.*

1. *Paddle-wheels.*

Great Western steam-ship, of has paddle-wheels of 28 feet , making fifteen revolutions per the same speed as the engines ıake fifteen strokes per minute; his action will give a motion to els of just 15 miles per hour, as- v the wind and sails, or about s per hour without such assist- The speed of the wheels, there- ıy be stated at just double that of el, reckoned exclusively for that elonging to the steam only, the rate of speed across the Atlantic bout 9 miles per hour, inclusive ind and sails, and about 7½ miles r exclusive thereof, although both may be reckoned at 9 miles. the voyage to America is com- nade in about fourteen days, we following results:—

ys = 336 hours,
t the 9 miles per hour as an
—— [average of speed,
3,024 miles
——

ng, of course, that the length of will admit of this estimation.) gine power belonging to the vessel t 500 horses power, with 7 feet of stroke in the cylinder, and 15 per minute, answering to the f the paddle-wheels. One revo- f the wheels will be 14 feet, and gine motion being 15 times, as bove, this gives a motion of 210 minute, or 3½ feet per second, piston travelling in the cylinder. unel says that this is, in fact, the rate of propulsion of the *Great n*, and she is regarded as the voured paddle-wheel steamer that ıversed the ocean.

2. *The Screw.*

Archimedes vessel is furnished screw for its propeller, the dimen- f which are 5 ft. 9 in. diameter, feet horizontal length, having a given to it of 140 revolutions per , by 26 strokes of the engines. l by the wind and sails, this power y give a propulsive effect on the vessel of about 10 miles per hour, derived from the motion given to the screw of about 28 miles per hour, which shows a propulsion of about ⅓, attended with a loss of about ⅔ of that original motion. But taking off all the accelerated motion, both by machinery and the wind and sails, will, it is supposed, reduce the speed of 10 miles per hour down to 6 or 6¼ miles per hour, as that derived from the exclusive natural effect of the screw at the original speed of the engines of 26 strokes per minute.

Hence, the merits of the screw, on a comparison with paddle-wheels, stand at a much lower estimate, the screw losing ⅔ of the original motion, whilst paddle-wheels only lose ½ of their motion.

The *Mechanics' Magazine* states several defects belonging to the screw, that will always be an impediment to its competing with paddle-wheels, whether as regards utility, speed, power, or economy. The principal are—

1. The monstrous friction, caused by the enormous speed of the screw.
2. Complexity of gear-work, rendered necessary for the high velocity.
3. The unfavourable action of the blade at the centre of motion, where it becomes parallel to the line of the ship.

3. *The New Propeller.*

Some time ago, a very limited, yet highly satisfactory experiment was made with this new propeller, at the West India Docks, in 24 feet depth of still water,—that piece of water having been selected as the most proper for making the trial in the fullest and fairest manner. The object was to ascertain the respective and comparative merits of the Archimedean screw propeller, as fixed to the *Archimedes* steam-vessel, and those of the new propeller.

The motive power was obtained from a weight, permitted to descend through this 24 feet of still water, and propelling a model of each sort of propeller. The new propeller, made to a scale of 5 ft. 9 in. diameter, and only 4 ft. length, (just half that of the screw,) was by this weight propelled 12 feet distance in 15 seconds of time, whilst the screw could only propel 8 feet distance. Here was an advan-

nventor of which may be communicated tter addressed to L., care of the publisher ianics' Magazine.

tage of half more space or speed in the same time.

But with the propeller made into 8 feet length, (instead of the 4 feet,) the additional engine power then wanted and required to convert the 10 miles into 15 miles per hour will constitute all the difference for that purpose; that is to say, the increased length of the propeller, by making it double, will give it double power and half more speed in the same time, as the propeller remains at the same speed of 12 miles per hour, as applied when of the 4 feet length.

A steam-vessel with this propeller will not, in short, require more, (if so much,) than about one-half engine power; the cost of fitting-up will therefore be proportionally less; it will be worked, also, at permanently less expense, causing a considerable saving in the yearly expenditure of fuel and labour.

Steam-vessels may therefore no longer be reproached as being only lumber vessels, for by this improvement they will become vessels of great capacity for cargo.

It is presumed that they will be also much more manageable than when encumbered with paddle-wheels.

Finally, it will be quite easy, as far as any thing like a judgment may be formed from the preceding experiments and data, to get up the speed to 20 miles per hour, and in some cases without requiring any machinery more than the engine motion simply applied in the most direct manner.

Comparative View of Engine Power applied to the three several plans for the propelling of vessels.

	Engine Motion.	Propeller Motion.	Propulsion to the Vessel.
New Propeller	3½ feet per second	12 miles per hour	10 miles per hour, or 15 miles per hour, or 20 miles per hour.
Paddle-wheels	3½ feet per second	15 miles per hour with wind and sails.	9 miles per hour with wind and sails, or 7½ miles per hour without wind and sails.
Screw	2½ feet per second	28 miles per hour with wind and sails.	only 10 miles per hour, with every assistance.

L.

MECHANICAL CHIMNEY SWEEPING.

Sir,—I was sorry to find in your last Number (page 135) so disingenuous a reply from Mr. Emslie, who adheres to his own opinion with a pertinacity and inattention to facts, by no means creditable to his view of the question.

I would beg to assure Mr. Emslie, that my mind is "left open for the unprejudiced consideration" of every plan that may be brought forward for the purpose of cleansing chimneys by mechanical means, whether it be the introduction of a principle entirely new, or—as in Mr. Emslie's case—the revival of an obsolete plan.

The question is one in practical domestic science in which I have felt considerable interest, and to which I have given some attention; at the same time, in reply to Mr. Emslie's insinuation, I beg to state, that the question is one in *which, personally,* I am altogether *disinterested. I am by no means prepared* to say that Glass's is a *perfect* machine for the purpose, yet it is generally held to be decidedly the best hitherto produced.* From a practical knowledge of what has been done, and also of what is now doing in this matter, I might stand upon my own opinion, yet in this case I am not left to do so. The vast superiority of Glass's machine has been established by many years' experience, to the satisfaction of the legislature, as well as of those gentlemen, who, from motives of the purest humanity undertook the emancipation of the "climbing-boys," and the introduction of the *very best machine* that could be found, without regard to any particular plans or individuals.

Like the master chimney-sweeps before

* I say *hitherto*, because I am aware that a plan has recently been patented which professes to accomplish that to which Glass's machine cannot pretend, viz., to sweep chimneys having any number of right-angled turnings, without requiring the provision of any soot-doors.

se of Lords, Mr. Emslie has
l a drawing of such a chimney
rld never saw before—and to es-
hat? The superiority of the
ghted brush, and pulley system!
imslie is peculiarly unfortunate
illustration," for he proves too
l thereby refutes his own argu-
Ie admits (most truly) that the
é chimney which he has sketch-
hich never existed but on paper)
: swept by the rope and weighted
ne, but requires in addition, *a*
dled scraper! I shall not join
ı Mr. Emslie with respect to the
ive merits of *brushes* v. *scrapers;*
excellent in their way; but as
implicity, efficiency, economy,
ersality of application of the two
-that is, of the "flexible rod,"
ıow justly exploded "weighted-
stem," there can scarcely be a
the mind of any impartial person
ch "has it."

ıly to Mr. Emslie's question—
single flue be pointed out, which
Machine is capable of cleansing,
weighted-brush mode is not
ble to effect?"—I reply, yes; a
at number. All flues having
izontal passages, require a *long-*
apparatus of some kind or other
the cleansing of the horizontal
ae flexible jointed rods of Mr.
e better adapted for this purpose
y thing else—whether they be
l with a brush or a scraper.
ghted brush alone cannot, under
umstances, cleanse the horizontal
chimneys, but must have a
nachine, (or something equiva-
ɔ act in conjunction with it;
nachine, then, may as well do
le, and the weighted brush go

"the tomb of all the Capulets."

ı of having two distinct machines
rm an operation which one of
he essential one—is capable of
ing alone, is preposterous.

not trouble you to engrave any
of the kind of chimneys referred
ur readers will find them ready
hands in Mr. Stevens's little
t.*

M'Gillivray's suggestion for improving the rope and pulley system is very good, but not good enough at this time to resuscitate that primitive, and now obsolete plan of chimney-sweeping; Glass's machine will, (as he states,) "be found by far the most economical."

I remain, Sir,
Yours respectfully,
WM. BADDELEY.

London, Feb. 20, 1842.

* Hints on the Subject of Chimney-sweep-
ye had *gratis* at the Hand-in-Hand In-
ice, *Bridge-street, London.*

IMPROVED MODIFICATION OF A NEW ELECTROTYPE PROCESS.

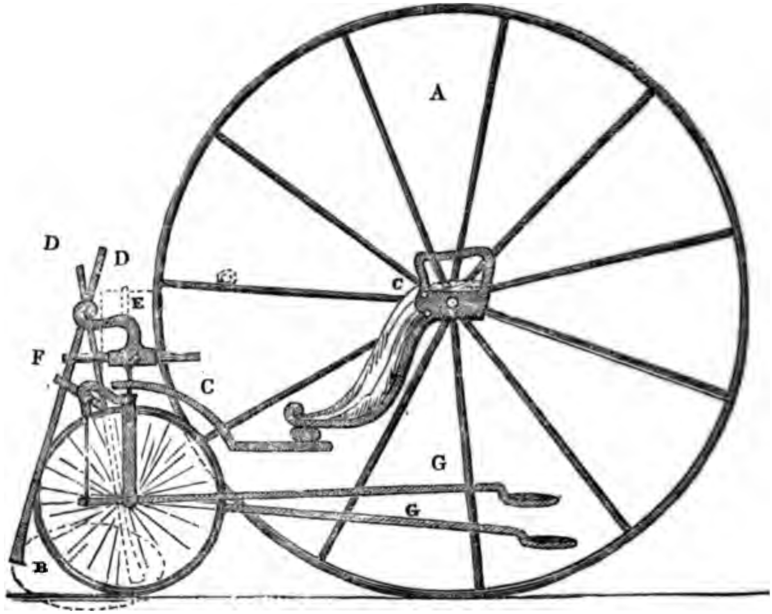
Sir,—A discovery has been recently made of etching copper plates, by first gilding them by the electrotype, and then delineating the drawing through the coat of gold to the copper. I tried the gilding process several times, but could not succeed in producing a firm coat of metal; and I am acquainted with many scientific gentlemen who arrived at the same result, namely, a dirty black powder easily rubbed off, instead of the "*glittering metallic surface of incomparable beauty*" as it has been designated by some. Indeed I am half inclined to doubt that such a thing has ever been accomplished. My trials with the "noble" metals, proving in every case a decided failure, I thought of trying what could be done by means of the cupreous deposit, as I always found it perfectly pure and firm, provided only, care were taken in conducting the process. My first experiment proved quite successful; the subject of it was an ordinary steel plate: I covered it with a thin film of copper, which I afterwards etched, and bit up with dilute sulphuric acid. Far finer and closer lines can be formed on this ground than on that in general use at present, which arises from the latter being required to be laid comparatively thicker on, which, together with its property of adhering to the point of the tool during the process, sometimes sends a whole body of fine line-work into a broken unmeaning mass. What I consider the greatest advantage attending working on a metallic "ground," is, that after the effect, &c. is bit in, the plate can again undergo the same process, if the resulting etching be not satisfactory—an object not to be attained by the employment of grounds of a waxy or resinous nature. Such grounds always require to be totally removed before the picture can be pronounced

perfect—at least, as regards the etching; and if the same be found, on inspection, to be not of the requisite degree of colour or depth of tone, the touching up is attended with much labour and uncertainty. A plate furnished with a metallic ground, can, however, be bit deeper, even *after* a proof has been printed from it, the coat of metal, of course, being allowed to remain on the plate.

Sir, I am yours respectfully,

M. Newman.

DESIGN FOR A VELOCIPEDE.



Sir,—Expecting to be engaged in a situation, about three months ago, where there would necessarily be a great deal of travelling, and the income hardly sufficient to cover the expense of keeping a horse, over and above other expenditures, I applied myself to devise some method whereby I might travel with more ease and facility, than I could possibly do without some combination of art with nature. The following is the result of my cogitations, which I shall feel obliged by your submitting to your numerous readers, in order that any deficiency in the principle may be pointed out, for the benefit of mankind generally, and your *humble servant* in particular, as I intend to fit up such a machine, with the expectation of its being really useful.

A is one of two large light wheels, 8 feet in diameter, (which is the largest size, according to Professor Babbege, that can be rendered useful for such purposes;) B is a guide-wheel, about 3 feet; C C is the body, or fixed frame of the carriage, made of wrought iron, and as light as possible: there may either be a seat for two persons, and a packing box or boot underneath; or, if designed for one traveller alone, it may merely be a platform case covered with loose oilcloth, to carry his food or any small article in. D D are the propellers, worked by the opposite cranks F, (on the same shaft,) and sliding freely up and down in self-adjusting guide-sockets, hung each on its own axis in the moveable frame E, which, when placed in the

most approved in practice, is ·e by the screw at the lower part frame. G G are the treadles ·ork the cranks. The wheel B, crank propellers and adjusting re all fixed in a straightforward . on the spindle, which works and passes through part of the :; consequently, the guiding is by a kind of side pressure, simi- fect to that of a person pushing a en his hands are applied to some object, as an abutment.*

advantages expected to be de- om this arrangement, over any I : seen, I shall endeavour to point d any fallacy which may appear, mprovement which may suggest any of your ingenious readers, I :l pleasure in its being pointed nticipate, when the speed is once (which, on a good hard Mac- l road, will be readily done,) it easily kept up by *one* complete f the treadles to about four revo- of the large wheels, which, being in circumference, makes a clear of 32 yards, or about 7 smart for every 200 yards! The ope- ntinually rests on his right foot, ears the propellers of the ground, ws the guide-wheel to run freely:† ight to be a stout spring, or coun- by "dead weight," for the pur- carrying the crank over the upper as connected with the right foot, e rests on that foot, it will need a start it. The cranks ought to be ted with respect to each other, t as the propeller is touching the the mans's greatest force is ope- n the crank (*i. e.* when it is at right with the treadles;) then the point propeller describes an elliptic, will strike the ground more or cording to the position of the frame B, which lifts the wheel re-part of the vehicle off the , and drags the hinder part after course, the guide-wheel has al- quired a certain degree of motion, refore there is no check when it aches the ground.

With regard to the two machines described by Mr. Baddeley, I beg leave to state that I saw them tried fifteen years ago, in this town, by some good workmen, of the name of "Kilburn," and either way, (*i. e.* by using a handle or treadles to the cranks of the large wheels,) they were such hard work that they were speedily laid aside. Another great benefit I anticipate from my arrangement is, that the hind wheels being disconnected, will make the machine turn with more facility, as the inner wheel can stand comparatively still, while the outer one works right round it.

I beg also to recommend the following modification of the above arrangement for steam-carriages on common roads, whereby the engines may be made of much less power, considerably lighter, and more effective. I am aware that Mr. Gurney and others have used propellers, but theirs have been placed, invariably, underneath the *whole weight* of the carriage and engine, thus constraining it to lift the whole of that weight in the circular part of the stroke. Now, I would propose that the engine, carriage, and load, should be all pretty nearly balanced on two wheels, (moving freely and independent of each other, as in an ordinary carriage;) further, that the preponderance ought to lean on the third, or guide-wheel. The arrangement may be also such, as that the engine shall be always working slowly, only accumulating power at one part, and throwing it out briskly at that part of the stroke where it is most effective. The two propellers might, perhaps, be more efficiently placed by using *two* guide-frames, one a little in advance of the other, so that when one propeller had lifted the fore-part of the carriage, and dragged it forward, the other one—its guide being more in advance—would give the whole a smart push, and so keep up or increase the velocity required.

In all the machines of this kind I have yet seen described, the traveller had harder to work, the quicker his pace; in this machine it is the reverse.

I remain, Sir,

Yours respectfully,

WM. PEARSON.

Bishop Auckland.

---

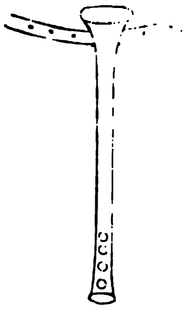
* I almost forgot to remark, that there ought cular spring "brake," on which the ope ht lay his right hand, and stop the carriage , without any strain on the machine.

† lotted lines or slide will show how I mean: traveller eases up his foot, the weight ver or the propeller the crank begins to act.

REMEDY FOR SPONTANEOUS COMBUSTION OF COALS—ARMAMENT OF H. M. STEAM FRIGATE "GEYSER."

Captain Carpenter, of Her Majesty's steam frigate *Geyser*, has suggested the following remedy for spontaneous combustion.

It is proposed to have several cast-iron tubes, with holes at the lower part, as shown in the following figure, passing into the bunker or coal-hole, nearly to the bottom



of the vessel, and only a few inches from the ship's side, properly secured. The upper parts of these tubes are to come up to the deck, and to be contrived so as to give ventilation without allowing wet to go down amongst the coals. At the same time, means are to be afforded of pouring water into the bunkers, so as to flood them at the bottom in case of ignition. The water, in that case, would have a twofold effect, as it would not only extinguish the fire at the place where danger is to be apprehended, but at the same time the water poured into the tubes would destroy all ventilation, and would have a tendency to smother the part ignited.

The cause of spontaneous combustion is, evidently, first, the accumulation of gases from the moisture of the coals; and then, either heat or friction gives rise to ignition. To obviate this evil, if you allow the atmospheric air to pass freely amongst the coals, of course the gases could not accumulate, and combustion would not take place. If, however, there should be parts where the air did not penetrate, then the remedy is effected by pouring water into the bottom of the coal-box, and extinguishing the fire. The smoke issuing from the tube on deck would always give timely notice of danger; and the hose on deck, pointed into the upper part of the tube, would provide a sufficient supply of water always at hand. The tubes would be about six inches in diameter, and about a quarter of an inch thick; their length would be regulated by the depth of the coal-box.

Hay-stacks are provided with the same remedy against taking fire, by introducing a large basket tube down the centre; and why should not the same result take place in the manner proposed?

The *Geyser* is to be fitted, under Captain Carpenter's able direction, with several things which are likely to give rise to improvements in naval warfare. In the first place, she is to have two guns weighing 114 cwt. each, to carry solid shot and shell. The range of these guns will be five thousand yards, and they will carry further than any gun that has yet been cast, by 400 yards. This vessel will, consequently, have it in her power to disable the largest ship in the world, and at the same time to keep out of harm's way.

The pinnace of the *Geyser* will be fitted with a small disc engine, and Captain Carpenter's patent propellers.* This boat will be used occasionally as a tug, to assist ships in calms; or, should the machinery of the *Geyser* be injured by shot in action, this boat could tow her out of danger. The boat could also be used with advantage in towing boats filled with troops, especially such boats as those fitted over the paddle-boxes on Captain Smith's plan, (with which the *Geyser* is also provided,)—in watering a fleet—in sounding a-head of a fleet, in navigations like those of China—in communicating with ships at a great distance, where it would be impossible to pull with oars, &c. &c.

N.

BURSTING OF EMPTY PIPES.

Sir,—Mr. Claxton's off-hand explanation of the above "singular phenomenon" lets in no new light upon the matter; he has gone upon the groundless supposition that one part of the syphon was *outside* the house, the other *inside*. This is incorrect—the whole is external, and not liable to any such vicissitudes as are imagined.

To Mr. C., and the other correspondents who attribute the bursting of the

* For a full description of these see Mech. Mag., vol. xxxiv. page 258.

the condensation of vapour, the on of water, and subsequently of eg to say, that if such an effect ossibly have been traced to such ;, "my stock of general knowwould, I apprehend, have been adequate to the solution of the n.

difficulty arises solely from a ponowledge that no water whatever her formed or collected within the d pipe, and to some far more agent or agents must the mischief buted.

t these may be I have yet to and remain

Yours respectfully,

Wm. Baddeley.

a, Feb. 21, 1842.

LF-INKING PRINTING PRESS.

—I am at present making a model w description of typographic press, ief novelty of which consists in requiring the aid of a work- supply the necessary ink, which mplished by means of a simple ective apparatus fixed to the end "*table*," or that part of the press ch the form of types is laid. The n" of the new construction has s, or other suitable means of ig stereotype plates thereto, and a ock of wood of the height of ortype is placed on the table of the this done, the inking rollers are d, so that when the table is drawn means of the winch, the plates d to the platen receive the amount required. The usual "tympan" employed, as in other presses; its is occupied by the "frisket," cut course, according to the nature of rk. When it is desired to pronpressions by the press, you place of smooth cloth, or flannel, on the of wood resting on the table, and and nail it fast at the edges. You lace the sheet of paper on this, and he frisket down; next roll the nder the platen and draw it down, he requisite pressure; then draw table again, when, on lifting the , the work will be found complete; at the same time, the plates are inked for the following impression. ollers, consequently, *go twice* over *tes before they are printed* from. I would have sent you a drawing of the whole, but I consider the description here sufficiently explicit to enable any mechanic to construct a press on this plan, or to alter to it any of the Stanhope, Albion, or other hand-presses in use. The kind termed the "Ruthven," is, I consider particularly adapted for the purpose, although the one I am now constructing, is of the "Stanhopean" construction, and I feel confident of its answering.

I am at the same time planning a method of adapting the principle to the same presses with ordinary types, without being restricted to the use of stereotype plates, a drawing of which I hope to send you shortly.

Sir, I am, respectfully yours,

M. I. Brazendale.

February 11, 1842.

DAVIES'S ELLIPTOGRAPH.

Sir,—Will you allow me to point out what appears to me an error in the construction of "Davies's Elliptograph," described in your No. 963?

The ellipsis is proposed to be struck from one leg of the instrument keeping in contact with a circular piece of steel, so inclined as to represent the shape required, when you look at it, in a line produced from the stem *a, a*. Now, if a point were attached to the guide *i*, that point would trace an ellipsis, whose longest diameter would equal the diameter of the steel disc employed; and the guide will, in all cases, describe such an ellipse, but the ink-pen described at *d*, will move in a line *parallel* to the small ellipse. Now, ellipses, whose diameters are in equal ratios, are *not* parallel. For instance: Suppose *g* be 1 inch $\frac{6}{8}$ths in diameter when inclined 45°, it will cause *i* to describe an oval, whose diameter is 1$\frac{6}{8}$ths and 1 inch (roughly); but slide *d*, so that it shall trace an oval, whose transverse diameter is 2$\frac{1}{2}$ inches, its conjugate diameter would be about 2$\frac{1}{8}$th, instead of which, it should be about 1$\frac{6}{8}$ths. What I mean, in short, is, that the "Elliptograph" would describe ovals by drawing large ones with lines parallel to a small one, which should not be.

An instrument to do what Mr. Davies's professes to accomplish, would undoubtedly be extremely useful, and I am not without hopes that the ingenious inventor will be able to overcome the defect I have pointed out.

Sir, I remain your obedient servant,

H. P.

Lambeth, February 8, 1842.

SIBERIAN GOLD MINES.

Whilst the gold mines of Brazil and Spanish America appear to be yearly falling off in their yield, those of Siberia, on the contrary, are yearly producing more. Nature (says a Russian report) has showered gold in abundance on the soil of Siberia. The eastern part of that vast country is remarkable at this time for its riches in the precious metals. The sands of the rivers there show the presence of gold in their beds from the surface—in many places, for tens of square versts—as for example in the river Grand Birussa, on the borders of the governments of Yenisseisk and Irkoutsk, and in the basins of the Tongouska superior, of the Oudérei and the Pile, which water the first of those governments. From the savage country it used to be, Siberia has become the realm of gold; its riches may now be accounted such, although the road to them has been paved with silver, it may be said, and made good by persevering industry.

The explorations of the gold mines have been chiefly extended by private adventurers from the example of those worked by the Crown. Excepting the districts belonging to the imperial mines of Kolyvano Voskressensk and Nertschinsk, or the country situated beyond the Baikal, the adventures of gold mining, and the search for veins of gold, in all the rest of Siberia, have been surrendered to private enterprise on certain conditions. For a long time the speculators searched fruitlessly in the deserts of that vast country, and lost their capitals and their health; but at length nature yielded to the perseverance of man, gold was discovered, and its working commenced in 1829. From this date it is curious to observe the rapid development of private (alone) gold mining in Siberia, according to the following official statement:—

	Poods.	Livres.	Zolot.
In 1829	1	10	11 48-96
1830	4	22	39
1831	4	4	2 18-96
1832	15	37	40 72-96
1833	30	28	81 92-96
1834	52	29	58 36-96
1835	72	19	10 12-96
1836	84	20	9 18-96
1837	106	18	17 58-96
1838	166	22	11 60-96
1839	159	18	55 24-96
1840	211	39	40 48-96
Total of the 12 yrs.	912	1	12 79-96

Upon this quantity the Crown has received, by way of quit rent, 137 poods of gold, and the remaining 775 poods remained the property of the speculators. The pood, it is necessary to observe again, is equal to rather more than 36lbs. British avoirdupois weight.

Thus in ten years the production has increased from 1 to 212 poods per annum, from private enterprise alone. But, in fact, the year of gold mining consists of the four months of summer only, during which the washings of the gold sands, and the extraction of gold takes place in Siberia, and particularly in its eastern parts; and it is proper to notice that all the workings were conducted by people of no experience in that branch of industry, in a country altogether unknown, covered with thick forests, impenetrable morass and mountains, where no trace of the passage of man could be found, and where savage hunters had scarcely ever set foot.

The year 1841, will, however, it is said, furnish a more irrefragable proof still of the immense mineral wealth of Siberia. Private enterprise will have extracted from it nearly 100 poods of gold more than in 1840. In this amount will be included for nearly 35 poods from the deposits discovered last year by the trader *Miasnikoff*, the working of which has not employed more than 300 labourers. "What other industry," says the report, "can, with ten men only, produce in the space of four months only, to the amount of 50,000 silver roubles of a substance which is of never-varying demand and value?—The silver rouble, it may be noted, is equal to about 3*s*. 2¾*d*. sterling. —At present the adventurers confine their enterprises to the gold to be found among the sands of the rivers, and so long as they are successful they are likely to carry their researches no farther; but the question arises, and the solution will some time or other be sought, whence do these golden sands derive their supplies? When the river workings, which may suffice for the present age, fail, it is probable that more extensive researches will trace the mineralogical treasures of Siberia to their source.—*Mining Journal*.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

ANTHONY BERNHARD VON RATHEN, OF KINGSTON-UPON-HULL, CIVIL ENGINEER, *for a new method or methods (called by the inventor, "The United Stationary and Locomotive System) of propelling locomotive carriages on railroads and common roads, and vessels on rivers and canals, by the application of a power produced or obtained by means of machinery and apparatus unconnected with the carriages and vessels to be propelled.*—Enrolment Office, Jan. 28, 1841.

This system of propulsion is proposed to

ried out by the employment of com-
d air, fabricated at suitable stations,
npressing apparatus worked by steam
'. For this purpose, three double-
ipumps, worked by a three-throw crank,
er suitable arrangement of mechanism,
laced side by side. The diameter of
orking barrel of the first is 4 feet, of
ext, 2 feet, and of the third, 1 foot.
arger cylinder receives its supply of air
the atmosphere, and forces it into the
d, the diminished capacity of which
resses it to the extent of four atmo-
es; from the second cylinder it is driven
the smaller, where, being again four
compressed, its pressure becomes equal
rteen atmospheres. Stationary maga-
are charged with compressed air of
ensity, which is admitted, as required,
the magazine of a locomotive engine
ender. Machinery equivalent to a
cylinder and piston is attached to the
otive, which, being acted upon by the
ressed air, propels the engine and train
riages along. The locomotive engine
vided with an ingenious apparatus for
iting the escape of the condensed air,
it notwithstanding its continually de-
ng density within the magazine, it
i exerts a uniform force of four atmo-
s on the working pistons, until the
is reduced to that pressure. Similar
ines of compressed air being placed in
essel fitted with suitable machinery and
lling apparatus may likewise be simi-
propelled.

the purpose of transmitting the com-
d air from the stationary to the move-
agazines, the patentee proposes to use
ble pipe, composed of two thicknesses
ong cloth, with white-lead, or other
it, between them, and surrounded at
als with strong metal rings; metal
i being placed intermediately between
ngs, to give the requisite strength with-
mpairing the flexibility. How the
tee can maintain an exclusive right to
ibrication (! ! !) of compressed air, or
application to the foregoing purposes,
ow not, but he claims :—

The exclusive right of fabricating and
ving compressed air, to be used as a
lling power on locomotive carriages,
ilroads or common roads, and vessels
ers and canals, according to the united
nary and locomotive system.

The transmitting or removing the pro-
g power, viz., compressed air, from the
where it has been produced or obtained,
: place where it is intended to be used,
s to say, from the stationary magazine
i locomotive magazine.

The application of compressed air as a
propelling power for propelling locomotive
carriages on railroads or common roads, and
vessels on rivers and canals.

4. The exclusive right to the whole com-
bination of machinery and apparatus as
before described, or such part or parts
thereof as may be necessary for fabricating,
transmitting, and applying compressed air
to the propelling of locomotive carriages on
railroads and common roads, and vessels on
canals and rivers, according to the united
stationary and locomotive system.

Anthony Bernhard Von Rathen, of Kingston-upon-Hull, Engineer, *for improvements in high-pressure and other steam-boilers, combined with a new mode or principle of supplying them with water.* Enrolment Office, January 28, 1842.

These improvements consist in a method of supplying the steam-boilers with water, not immediately, but through a number of separate closed vessels, pipes, or water chambers. The cold or condensed, or otherwise prepared or warmed, fresh water, is forced by the pump or water column, from the reservoir into the water-chamber at the end of the flues, (generally next to the chimney;) when this is entirely filled, but not before, the second chamber is provided, and if that is fully supplied, the water is forced into the third; and so through any given number of separate water-chambers, till at last the water enters the steam-chamber, or compartment where room is left for the steam to disengage itself from the heated water. By the term steam chamber is meant either a part or the whole steam-boiler, as the case may be; and in the steam-chamber, the function of regulating the water for the supply of the first chamber is carried on in the ordinary manner.

The flues through which the flame, heat, or gaseous matter is carried into the chimney are constructed so that the heated air must pass through the water vessels, and thus heat the water contained in them respectively, in a degree, diminishing in proportion with the increase of their distance from the fire-box. These flues the inventor calls external metallic flues, or double water-pipes.

It is evident that, by this mode of supplying the water and conducting it in an opposite direction with the heated air and smoke, the water will gradually become hotter the nearer it comes to the steam-chamber, which is over and next to the fire-box. And the heat passing through the flues in the interior of the pipes will, in the inverse proportion, diminish in heat the more the distance from the fire-box is increased, and the nearer they come to the chimney.

The object of this invention here generally described is, to carry the absorption of heat in the boiler as far as possible, and to

reduce the loss of heat in smoke, flame, or heated air, to a minimum.

To quicken still further the absorption of heat by the water, the upper part of the flues, or head flues, is covered with wire threads, woven or united in such a manner, that the points of the vertical wire-threads repose upon or touch the upper parts of the flues, and, projecting into the water, thereby communicate the heat more rapidly to it by radiation.

These external water pipes, or external auxiliary flues, surrounded by water pipes, can be added to every kind of boiler now in use, whether stationary, locomotive, or marine, its application to each of which is shown in the specification.

The claim is, 1. To the exclusive use and application of a new mode or principle of supplying the water successively through any given number of separate closed vessels, or water passages, to the steam-chamber, or that part of the steam-boiler where the steam is allowed to disengage itself from the water; when this mode or principle is applied in conjunction with the construction and arrangements as hereinbefore described, viz. when the water, in its way from the chimney to the steam-chamber, takes the opposite course to the flames, smoke, or heated air, which issue from the fire-box and proceed to the chimney, and when the water is so conducted as to be continually in contact with the heated air or vapours, in such manner, that in its course to the steam-chamber it is gradually increasing in heat. And when, on the other hand, the heated air or gaseous matter, in its course from the fire-box, is continually decreasing in heat, the nearer it comes to the chimney. 2. To the invention and construction of double pipes, as before described, for the conveyance of water to the steam-chamber; and of smoke or heated air to the chimney; and of the separating or water chambers made in the interior of the boiler itself. "But I limit not my exclusive right to this new mode and principle in the supply of water and conveyance of heat exactly to the specimens which I have given of its application, in the construction and shape of boilers, as well as of water vessels or pipes through which the flues pass. But I distinctly disclaim any exclusive right to any other part of the construction of steam-boilers herein described, and of the covering of the flues in the steam-boiler with wire-cloth, unless such covering of the flues is applied, as aforesaid, in conjunction with my new mode and principle of supplying water, which to the best of my belief is new, not only in England, but in any country in the world!"

LIST OF DESIGNS REGISTERED BETWEEN JANUARY 26TH, AND FEBRUARY 23RD, 1842.

Date of Registration. 1842.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Jan. 26	1071	Solomon Riley	Cantoon	1 years.
27	1072	John Mill	Letter and money balance	3
28	1073	George Ratcliff	Fender	3
"	1074	Thomas Marsh	Ditto	3
31	1075,6	Watson and Son	Carpet	1
Feb. 1	1077	Patrick Cowan	Pressure gauge	1
4	1078	B. Walton and Co.	Dish cover	3
"	1079	Albert Potter	Carpet	1
"	1080	Ditto	Ditto	1
"	1081	Wm. Ewd. Statham and Co.	Economic laboratory	3
"	1082	Lea and Co.	Carpet	1
7	1083	John Chaturn	Button	3
"	1084	Daniel Beale Harvey	Pen	3
8	1085	The Colebrookdale Company	Stove	3
"	1086	John Sheldon	Unique pocket companion pencil case	3
9	1087	Lea and Co.	Carpet	1
"	1088	McCulloch and Co.	Lithographic press	3
"	1089	Benjamin Cook, jun.	Bedstead	3
10	1090	Newcomb, Son, and Jones	Carpet	1
11	1091	Richard Grove Lowe	Protector to workmen employed on railways	3
"	1092,3	Richard Richardson	Gambroon	1
14	1094	John Chatwin	Button	3
15	1095,9	H. and J. Dixon	Carpet	1
17	1100	Thomas and C. Clark	Coffee mill	3
"	1101	John Beckett	Metallic plate	3
18	1102	H. and T. Wood	Table cover	1
21	1103	Hancock, Rixon and Dunt	Chandelier	3
"	1104	John and Francis Harwood	Letter clip	3
23	1105	Samuel Ackroyd	Fender	3

' OF ENGLISH PATENTS GRANTED BETWEEN THE 27TH OF JANUARY, AND THE 21ST OF FEBRUARY, 1842.

James Baggaly, of Sheffield, seal engraver, ain improvements in combs for the hair, and are also applicable to combing other fibrous ices. January 29; six months.

a Hughes, of Whitehall Mill, Chapel-le-frith, paper maker, for certain improvements in ethod or process of manufacturing paper. y 29; six months.

's Hunt, of Whitehall, gent., for improve- in the manufacture of bricks. Jan. 31; six s.

les Wye Williams, of Liverpool, gent., for improvements in the making and moulding ts, artificial fuel, and other substances. Ja- 31; six months

y Fowler Broadwood, of Great Pulteney- Golden-square, Esq., for an improvement in rt of a pianoforte, harpsichord, or other the strument, commonly called the name board. ry 2: six months.

am Newton, of Chancery-lane, civil engi- r certain improved apparatus to be adapted making machinery, for the production of a escription of elastic fabric from silk, cotton, linen, and other fibrous materials. (Being munication.) February 8; six months.

rley Willcocks Sleigh, K. T. S., of Manches- tain in her Majesty's service, for a certain , or certain methods of effecting and form- ltered floating harbours of safety, by the ment of certain buoyant sea barriers, appli- hereto, and which said improvements are plicable to, and useful for, the formation of aters, floating bridges, light-houses, and ;, the protection of pier-heads, embank- and for other similar purposes. February 8; nths.

es Hancock, of Grosvenor-place, artist, for improvements in printing cotton, silk, , and other stuffs. February 8; six months.

amin Biram, of Wentworth, Yorkshire Col- iewer, for certain improvements in the con- n and application of rotary engines. Fe- 9; six months.

rick Harlow, of Rotherhithe, carpenter, for ements in paving or covering roads and other s, and in machinery for cutting the material used for those purposes. February 9; six s.

n Baggs, of King's-square, Middlesex, che- or improvements in obtaining motive power ns of carbonic acid, and also by a peculiar tion of heated air. February 9; six months.

stopher Nickels, of York-road, Lambeth, nan, for improvements in the manufacture ed fabrics. February 10; six months.

iam Brook Addison, of Bradford, in the of York, manufacturer, for certain improve- in machinery for spinning worsted and yarn. February 10; six months.

ge Jarman, of Leeds, flax and cotton spinner; Cook, of Hathersage, Derby, heckle and manufacturer; and Joshua Wordsworth, of aforesaid, machine-maker, for certain im- ents in machinery for spinning flax, hemp, r. February 14; six months.

es Andrew, of Manchester, manufacturer, for improvements in the method or process of ng or dressing yarns or warps for weaving. ry 15; six months.

les Thomas Holcombe, of Bankside, South- iron-merchant, for certain improvements in nufacture of fuel, and in obtaining products manufacture February 15; six months.

Osbaldeston, of Blackburn, Lancaster, metal naker, for improvements in looms for weav- February 15: six months.

ander Rousseau, of the Strand, manufacturer, provements in fire-arms. (Being a commu- n.) *February 15; six months.*

George Haden, of Trowbridge, Wilts, engineer, for certain improvements in apparatus, for warming and ventilating buildings. February 15; six months.

John Lewthwaite, of East-street, Manchester-square, engineer, for improvements in steam-engines and boilers. February 15; six months.

Thomas Russell Crampton, of Lisson-grove, engineer; and John Coope Haddan, of Moorgate-street, civil engineer, for improvements in steam-engines and railway carriages. February 15; six months.

Robert Wornum, of Store-street, Bedford-square, pianoforte maker, for improvements in the actions of pianofortes. February 15; six months.

Daniel Greenfield, the elder, of Birmingham, brass-founder, for an improvement in the manufacture of hollow metal knobs for the handles of door, and other locks. February 21; six months.

Moses Poole, of Lincoln's-inn, gentleman, for improvements in treating, refining, and purifying oils and other similar substances. (Being a communication.) February 21; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND SUBSEQUENT TO 22ND OF JANUARY, 1842, AND TO 22ND FEBRUARY FOLLOWING. FOUR MONTHS EACH TO SPECIFY.

Christopher Nickels, of York-road, Lambeth, gentleman, for improvements in the manufacture of napped fabrics. Sealed January 27.

John Jones, of the Smethwick iron-works, near Birmingham, engineer, for certain improvements in steam-engines, and in the mode or methods of obtaining power from the use of steam, part of which improvements are applicable to the raising or forcing water, and for other purposes. February 4.

James Thorburn, of Manchester, machinist, for certain improvements in machinery for producing knitted fabrics. February 4.

Nathaniel Benjamin, of Camberwell, Surrey, gentleman, for improvements in the manufacture of type. (Being a communication from abroad.) February 11.

Louis Lachenal, of Tichfield-street, Soho, mechanic, and Antoine Vieyres, of Pall-Mall, watchmaker, for improvements in machinery for cutting cork. February 11.

John George Bodmer, of Manchester, engineer, for certain improvements in propelling vessels on water, part of which improvements apply also to steam-engines to be employed on land. February 14.

George Mannering, of Dover, plumber, and Henry Harrison, of Ashford, plumber, for certain improvements in the means of raising water and other fluids. February 16.

PATENT FOR IRELAND GRANTED IN JANUARY, 1842.

Joshua Taylor Beale, for certain improvements in engines to be worked by steam, water, gas, or vapours, which improved engine may also be used as a pump.

NOTES AND NOTICES.

The East India Company's Steam Frigate "Memnon."—On Tuesday morning last, this splendid vessel, of 1,100 tons burden, mounting two 64-pounders, and four 32-pounder guns, and having them and all her shot on board, with about 300 tons of coals, and a cargo sufficiently heavy to test her capabilities for a long voyage, was loosed from her moorings at

Mechanics' Magazine,

SEUM, REGISTER, JOURNAL, AND GAZETTE.

69.] SATURDAY, MARCH 5, 1842. [Price 6*d.*

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

Fig. 1.

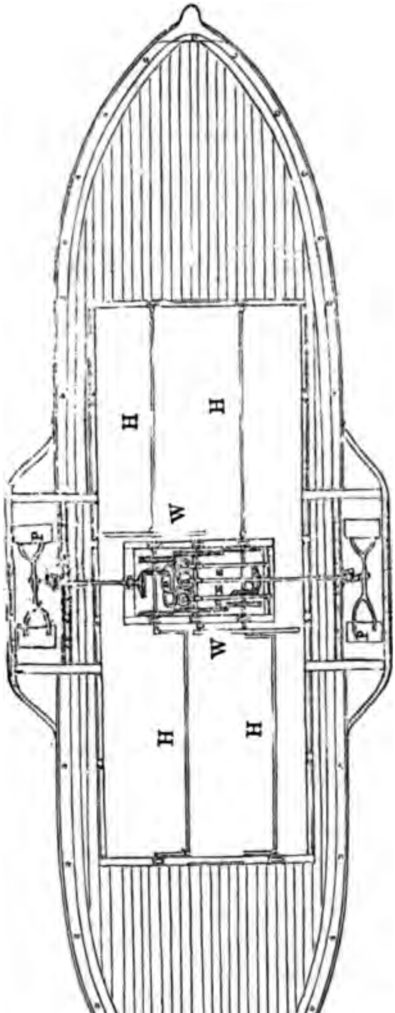


Fig. 2.

Blackwall, and proceeded down the river in excellent style, for the purpose of ascertaining the efficiency of her engines. The "Memnon" was built by Mr. Fletcher, and her engines, which are of 400 horses power, have been constructed by Messrs. Maudslay, Sons, and Field. The boilers, which are of copper, are furnished with a change water apparatus, by which the salt water is kept from exceeding a certain point of saturation, and the formation of any injurious deposit is thereby prevented. There are four steam cylinders working in pairs, the piston-rods being attached to a T-piece, from the lower end of which a long connecting-rod proceeds up to the main crank-shaft. The engines are fitted with expansion gearing, so as to admit of the consumption of fuel being regulated to suit every circumstance of slow or quick steaming. The paddle-wheels, which are of the ordinary kind, and 26 feet in diameter, are fitted with the disconnecting gear recently patented by Mr. Maudslay, and described at page 303 of our 35th volume. On arriving at Long-reach, the full power of the steam was applied, when the engines worked with a beautiful motion, the vibration being scarcely perceptible. The vessel, with her heavy cargo, was propelled by steam alone at the rate of 11¼ miles per hour, to the great satisfaction of her able commander, Captain Powell. Among the gentlemen on board were Captain Pepper, of the "Ackbar," another new (Clyde-built) vessel of the same dimensions, belonging to the East India Company; Captain Brasco, attached to the Neapolitan Government; Mr. Mason, secretary to the Indian Marine; Mr. Fletcher, the builder; Messrs. Maudslays and Mr. Field, the engineers; and several scientific persons. The "Memnon" proceeded as far as the Little Nore, and during the trip, the precision and simplicity with which the disconnecting gear removed the stupendous paddle-wheel from the engine, and again attached it in an incredibly short space of time, greatly surprised such of the naval officers as had never witnessed any thing of the kind before. On reaching Sheerness, the "Memnon" was put about, and returned to Gravesend, where she will complete her stores of ammunition, &c., and in a few days proceed direct to the seat of war in China, where she will doubtless prove a powerful auxiliary to the naval force assembling in that quarter.

Whitelaw and Stirrat's Water Mill. — There has recently been erected at the manufactory of Mr. Charles Matthews, Kensham Mills, Bradninch, near this city, one of Messrs. Whitelaw and Stirrat's Patent Hydraulic Machines. This ingenious piece of mechanism is intended, and, from what we can learn, it is believed will supersede the use of the common water-wheel, forming a better application of water power. The inventors seem to have kept in view simplicity and durability, combined with economy. From its many advantages over the water-wheels now in use, it is deemed an invention of great importance, and it is thought will shortly be brought generally into use, although this, which Mr. C. Matthews has so spiritedly caused to be erected at Kensham, is believed to be the only one at present at work in England. The ingenious inventors are of Scotland, and have establishments, it is believed, both at Glasgow and Paisley. The machine at Kensham, we are desired to state, Mr. Matthews will be most happy to show and explain to any gentleman who will favour him with a call.—*Exeter Flying Post.* [The machine above alluded to was made by Messrs. Donald and Craig, here, who have made a number of these water mills, all of which are giving every satisfaction to the parties using them. They have a number of them in hand, from 6 to 60 horses power, which will soon be erected in different parts of the country.—*Paisley Advertiser.*]

Uniformity of Time.—"Now that railwa ling has become so universal in the kingdor so much to annihilate *space*, the question became a matter of considerable importa he had long been of opinion that some plan adopted to prevent the errors and inconven every town in the kingdom setting its clo meridian of its own, different to every oth out of the same longitude. To show the e the evil to which he adverted, it would per sufficient for him to state that there was ence of 25 m. 28 sec. between the times a and Falmouth; that is to say, when it w at Falmouth, it was 25 m. 28 sec. past Dover. There was nearly a minute differ time between the east and west of Lond about a quarter of a minute difference betw east and west of Birmingham. The railroa tors had endeavoured to remedy this de keeping London time at all their statio there was this great inconvenience atten that all persons who resided west of Lond in great danger of being too late for the trai all the time tables of the Great Western Rai endeavour was made to remedy this diffic printing the correction for longitude. It o to him a year or two ago that it would be excellent plan if government would recomm adoption of one uniform time throughout th dom; and he was happy to find that his frie Dent, had turned his attention to the same and he quite agreed with him that they o adopt one meridian as a universal standa call it "British time." Happening to ment subject to his friend, Mr. Rowland Hill, as ter of some importance in connection with t office department, he informed him that he ceived a letter from Captain Basin Hall, in this very point; and as it embodied all (Mr. Osler) wished to say respecting it, he with the permission of the audience, read th to them. The lecturer here read the letter tain Basin Hall. The idea of the adoption neral standard for time throughout Great originated with the late Dr. Wollaston, w gested that all the post-office clocks throug different counties should be kept at Londo a measure which he considered might be ve accomplished, and which would greatly sim those arrangements of the post-office in whi was included as an element. He proposed late all the post-office clocks in the king means of the time brought from London the mail coach chronometers; and he had n that ere long, all the town clocks, and event the clocks and watches of private persons fall into the same course of regulation; so th one expression of time would prevail o country, and every clock and watch indicat hands the same hour and minute at th moment of absolute time."—*Mr. F. Osler Birm. Phil. Inst.*

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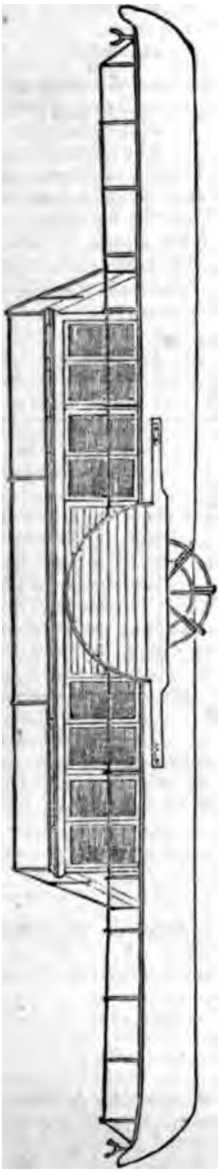

Fig. 1.

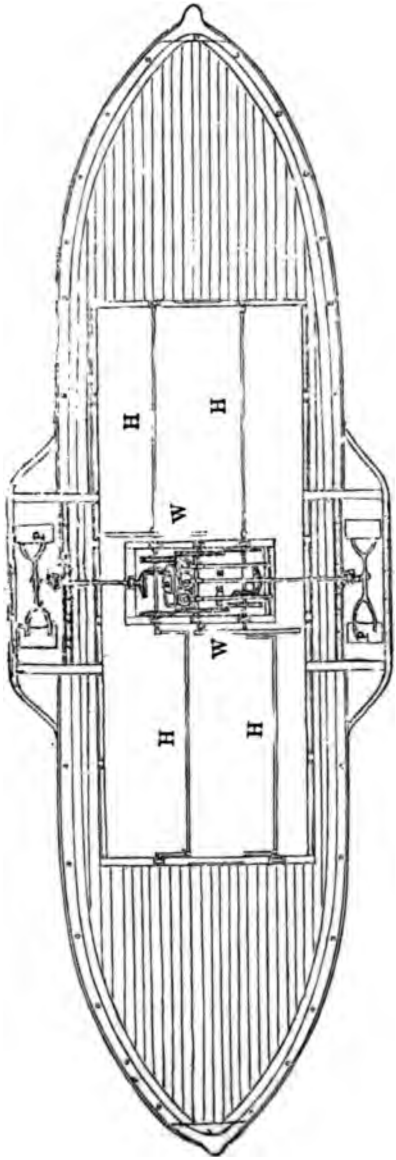

Fig. 2.

LONDON FIRES IN 1841.

" There is no danger so much to be dreaded,
There is no enemy so sure to conquer,
There is no death that we should so much fear,
Except bold infidelity—as Fire.
For with an enemy you may contend and conquer;
From the man-slayer you may by flight escape;
From beast of prey you may come off the victor;
From swelling billows you may swim to shore;
But with the raging flames who may contend?"

Sir,—It was well observed in the " leading journal," a short time since, that " probably a concurrence of disasters, similar to that under which Great Britain now suffers, never before visited the metropolis of a mighty nation. Famed alike for laws, for commerce, and for arms, she now sees, in time of peace, and without either hostile inroad or intestine broils, her palace of legislature, her emporium of trade, and her st house of trophies and of arms—all at moment in ruins—and each by a like lamity!" The great destroyer, F has been busily employed in the me polis during the year just ended, as appear from the following tabulated tome of his doings, which shows t during the year 1841, there were London and its suburbs 696 fires, viz.

MONTHS.	Number of Fires.	Number of Fatal Fires.	Number of Lives Lost.	Chimneys on Fire.	False Alarms.
January	59	0	0	9	4
February	68	1	1	9	5
March	63	1	1	10	2
April	59	0	0	10	4
May	56	1	2	10	3
June	50	2	2	8	5
July	45	1	1	9	5
August	63	0	0	2	11
September	51	2	2	2	6
October	67	3	4	9	7
November	63	3	4	5	6
December	52	2	2	9	9
Total . .	696	16	19	92	67

Of these fires, the number wherein the premises were totally destroyed is ....
Ditto ditto ditto very seriously damaged........
Ditto ditto ditto slightly damaged ....
Alarms occasioned by fires in chimneys ....
False alarms ....

Making the total number of calls ....

The number of instances in which an insurance had been effected on the Building an Contents was ....
On the Building only..
On the Contents only ....
Neither insured ....

But this statement only relates to the premises in which the fire *commenced.* A rigid scrutiny into the subject of in*surance, as connected* with all the properties *damaged* by these fires, giv following interesting and importa sults:—

insured..................	914
nsured..................	609
	1523
not insured	197
not insured	404
	601

umber of fires still continues to By reference to former re- will be seen that last year's fires , by fifteen, the number of the year; being a gross increase of ı the average number of the first ars' experience of the London ablishment.

umber of false alarms and of rising from chimneys on fire is ably below the average.

nost incredible number of fires ıeys have been attended by the of the establishment; but as they own at the time to be such, and y attended accordingly, they are rted. In several instances where ıen have been denied admittance, r proffered services refused, the ence has been, that the fire has d itself into contact with some ible part of the building, and the have eventually been obliged to the men whose services they be- unwisely rejected.

e twenty-four total losses, seven fires were so distant from the London engine station, as to pre- l possibility of rescuing the pre- which the fire began. In seven e firemen had to contend against eficiency, or very scanty supply , which paralyzed their efforts, dered their prompt attendance ng. In the remaining instances, l destruction of the premises was ible either to the highly inflam- ature of their contents, or to their mensions, and the head to which es had attained before discovered. ss of fires comprised the follow-

20, 4 A. M. Mr. Wilshire, tallow- and melter, Crucifix-lane, Ber- . This fire, which commenced in ufactory, had made great progress stages before it was discovered. A uster of firemen and engines were on the spot, *but the supply of water a long time exceedingly scanty*, and *factory and stable were destroyed*; a better supply of water being ultimately obtained, enabled the firemen to rescue the dwelling-house, shop, and five other buildings to which the flames had communicated.

January 29, ¾ A. M. Mr. Budd, chandler, North-street, Whitechapel-road. This was a small one-story house, which was destroyed before the engines could be brought to bear upon it. The two adjoining buildings, to which the fire had extended, were, however, preserved, with but little damage.

February 1, 8¾ P. M. Mr. Steire, cabinet-maker and upholsterer, Kew Horse-road, Richmond. This fire commenced in the workshops, which were consumed; but the dwelling-house and two adjacent buildings were preserved, with but little injury, although the nearest London engine station is 10 miles distant.

February 2, 10¼ A. M. Messrs. Painter and Co.'s furniture-warehouse, Finsbury-place, North. These premises were constructed in a very peculiar manner, having in the centre of the interior an opening upwards, surmounted by a dome, which from the basement to the roof displayed a number of galleries; the premises formerly belonged to Mr. Lackington, the celebrated bookseller, and during his occupancy, one of the royal mail-coaches was driven, (four-in-hand,) round the circular counter which occupied the space beneath the dome: this feat was repeated a few years ago, by Alexander, of Chiswell-street, for a wager of 200*l*. At the time stated, flames suddenly burst forth from the third floor, which comprised show-rooms filled with upholstery, bedding, &c. A number of workmen who were employed upon the premises strove for a time to suppress the flames; but finding their efforts unavailing, and the fire spreading with great rapidity, they retreated to the lower floors, and commenced removing some of the most valuable of their contents. In the mean time, messengers having conveyed intelligence of the fire to the several engine stations, a strong muster of men and engines were soon in attendance. The first, from the Whitecross-street station, and one from Messrs. Whitbread's brewery, were on the spot within a quarter of an hour after the alarm was given, and these were rapidly followed by engines from the other stations, as well as those belonging to the West of England and County Fire Offices, which were got into operation as quickly as possible. The construction of the premises and the highly combustible nature of their contents, however, caused the flames to rage with a fury that was altogether irresistible; by eleven o'clock the fire presented a truly awful appearance, the immense building, from the ground to the roof, with a frontage of nearly 100 feet, was one mass of flame

which raged half way across this wide street, the heat igniting ten of the houses on the opposite side. The fire soon communicated to the buildings on either side of those belonging to Messrs. Painter, and it seemed uncertain where the work of destruction would be stayed; soon after half-past eleven, however, the roof of Messrs. Painter's premises fell in with a tremendous crash, and considerably damped the fire, which temporary check was taken such good advantage of by the firemen, that in an hour after, all fear of further damage was at an end. Throughout the day the frost was most intense, and many of the firemen suffered severely from the cold. Notwithstanding the number of hours they were engaged, and the extraordinary difficulties under which they laboured, they never flagged until the fire was completely subdued. No less than 17 buildings were more or less damaged by this fire, the origin of which was never satisfactorily explained.

February 7, 11¾ P.M. Camberwell Old Church. This venerable fabric, some portions of which are nearly 1100 years old, was discovered to be on fire by a police constable, P 29, who, seeing a light in the organ gallery, sent information thereof to the inspector at the station-house, who, supposing robbers were in the church, sent a serjeant and two constables to secure them. In the mean time, the flames bursting forth from the tower, at once revealed the real character of the intruder. The parish engine was got out, but no water was forthcoming to make it available, and messengers were dispatched to town for the engines; but the "illumined sky" foreheralded their message, and the brigade engines from Waterloo-road, and Southwark-bridge-road, closely followed by the West of England, were soon on the spot, and were quickly succeeded by several others. A small pond of water being discovered in an adjoining field, one of the brigade engines was drawn up to it, and made to supply a second, which was placed intermediately and brought to bear upon the fire; but this supply was so small, as to be exhausted almost as soon as the engines got into full play. The West of England engine was judiciously placed at a plug in the Grove, and its hose was led through the house of Mrs. Hutton, who kindly consented to this arrangement, after her less liberal neighbours had refused a passage. Upwards of five hundred feet of leather hose was attached to this engine, and after a delay of nearly two hours a supply of water from the Vauxhall main at length issued from the plug, and was brought to bear upon the burning pile. One of the brigade engines ultimately took up a similar position, and joined its efforts towards cooling the ruins. It appears, that the stov heated the church was situated un north entrance, its chimney, or flue, ing to the flooring in the centre of t dle aisle, and thence through the so of the organ-loft to the top of the the end of one of the principal bea supported the organ-loft, had eviden jected into the centre of the flue, a supposed that soot having from time been deposited upon it, had been ig Sunday morning and set fire to the which burned slowly until it reac wainscoting of theorgan-loft, when into flames.

"Then sighed a shadowy sound
From the high loft where organ pip
glowing
In the red fire, a golden radiance thr
On the wide wreck around.
"'Passing away! away!'
Breathed those stupendous diapasons,
ing
Each for his fall; as of the tempest w
Winds sigh at close of day.
"Then came a wondrous sight!
Mitres, and robes, and shrouds of m
glimmered—
Or, argent, azure, sanguine, purpur
mered
E'en in the depth of night!
"Then round the finialed spire
Curled a bright flame, o'er tabernacle
Licking the ancient dust in groins ca
Through that majestic choir."

The appearance of the church by t the engines from town reached the sp awfully sublime, and will never be fo "while memory hold its seat," by those who witnessed the spectacle. night was moonlight, and very frosty distance (three miles) and the wate two hours late, prevented the fireme saving more than a small portion chancel, in which a happy coupl united in the "silken bonds of wedlo the following morning.

February 16, 3½ A.M. Mr. Hyde, b 112, Bermondsey-street. This fire, originated from some unascertained had attained a great head before its e was discovered, and soon after its o the whole of the building was on fi top to bottom. The firemen with th gines were promptly on the spot, bu exertions were paralyzed (as is almost the case in this locality) for want of upwards of three-quarters of an hour before any was obtained (and then the was scanty) from the Southwark main great efforts the firemen preserved th kitchen, slaughter-house, and live sto scathed.

il 7, 8¾ A.M. Mr. Turner, floor-cloth able-cover manufactory, Myddleton-St. John-street-road. These premises, occupied an area of considerable di-ons between Myddleton-street and 's-row, consisted of three brick build- – the factory, the japan and store , and another building of similar di-ons, used as a drying house. The nen had returned from breakfast at past 8 o'clock, when every thing d to be safe, but they had scarcely ed their labours when a cry was that the japan roofs were on fire: this part of the building the work of ction extended with such extraordinary ty, that within an hour the workshops tables were levelled with the ground. Farringdon-street, Holborn, and other es were promptly on the spot, and a ful supply of water being obtained, by ast 10 o'clock the fire was completely ed, but not until the whole of Mr. r's premises had been destroyed, and een of the surrounding buildings more injured.

e 8, 4½ A.M. Astley's Amphitheatre, ninster-bridge-road. On the 8th of this property had a narrow escape lestruction in consequence of an escape , by which the flooring and joisting orched in a cellar under the stage, and s every reason to believe that a similar nt upon this occasion led to the des-on of the building. At the time stated, constable Cotterell, of the L division, as passing down Stangate-street, ob-smoke issuing from the roof of the thea-nd immediately ran to the stage-door, ocked up Howell, a fireman belonging West of England Fire Office, who was ed nightly on the premises. On pro-g together into the theatre, they found t body of fire raging beneath the stage; ll seized the branch-pipe of a fire-which was placed at one corner of the and begged Cotterell to work the pump: some cause or other his request was tended to, and being overpowered by at and smoke, Howell was obliged to the branch-pipe and make his escape. n a few minutes after the alarm was the West of England engine, and that the brigade station in Waterloo-road d the spot, and in less than a quarter-hour at least half-a-dozen powerful s were stationed around the burning es, ready for action as soon as water be procured. Mr. Ducrow's house was separated from the theatre by a slight ion, the sleeping rooms being on the d floor, over the box and pit entrances. dint of great exertions, the beautiful *with the exception of two horses and* an ass) were saved. By 5 o'clock the whole of the theatre was one mass of livid flame, and presented an appearance resembling a mighty furnace. The attention of the firemen was directed to the preservation, if possible, of Mr. Ducrow's dwelling-house, as well as the numerous buildings which abutted all round the theatre, and their exertions were ultimately crowned with well-deserved success. The flames being vigorously opposed on all sides, the work of destruction was confined to the theatre; the surrounding buildings, to the number of twenty-five, being more or less injured, but none very seriously.

June 21, 3¼ A.M. Messrs. Harris and Billiter's oil warehouses, Mazepond, Southwark. This fire, which originated from some unknown cause, had gained a great head before it was discovered, and when it burst forth, from the highly inflammable nature of the stock, which was very heavy, it raged with a fury that defied all opposition. A strong force of firemen and engines were soon on the spot, but for three quarters of an hour no water could be obtained; the fire spread rapidly in all directions, and the extensive premises of Messrs. Fisher and Sons, leather-dressers, as well as those in which the fire commenced, were entirely destroyed. Water being ultimately obtained, the fire was stopped, but in addition to the foregoing, twenty-four buildings were more or less damaged.

July 2, 11 P.M. Mr. Reilly, chairmaker, Quicksett-row, New-road, Marylebone. From the quantity of small timber on the premises, the flames spread with the utmost rapidity; the dwelling-house being destroyed, and the workshops very seriously damaged.

July 10, 3¾ P.M. Mr. Nott, builder, High-street, Deptford. This fire commenced in the workshops in the rear of the timber-yard, through the shavings having ignited. The workmen endeavoured in vain to subdue the fire, and were compelled to retreat, the flames rapidly extending to the timber-yard, thence to the dwelling-house, and to several of those adjoining. A special train on the Greenwich railway brought intelligence to the brigade stations in town, from whence engines were immediately despatched, but before they could possibly reach the spot (four miles distant) Mr. Nott's premises were destroyed, and five other buildings on fire. Upwards of half-an-hour elapsed before water could be obtained, when a supply at length being procured from the Lewisham mains, the London and local engines were got to work, and succeeded in extinguishing the fire; three buildings being consumed, and eight more or less injured.

August 11, 1½ A.M. Mr. Waller, private dwelling-house, situate on the summit of the

hill, in the Grove, Blackheath. This extensive building was discovered to be on fire by police constable R, 199, who, with great difficulty, aroused the inmates to a sense of their danger; they were, however, by great exertions, got out in safety. The flames, which illuminated the heavens, soon put the London engines in motion, and that from Southwark-bridge-road, which travelled the distance (five miles) in twenty minutes, was the first to arrive, and was received with loud cheering from the persons assembled. Unfortunately, however, it was too late to save any portion of Mr. Waller's premises, which were one body of flames, but water being obtained, the firemen stopped the fire in the adjoining premises, to which it had communicated.

August 30, 3 A.M. Messrs. Cock and Son, plumbers, painters, and glaziers, Grove-road, Mile End-road. This fire commenced in a small timber building, used as a two-stall stable, the loft over it being filled with oil, paint, &c., which was entirely destroyed before the arrival of the firemen.

September 12, 9 P.M. Mr. Salmon, fruiterer, 86, Piccadilly. When first discovered by some passers-by in the street, the fire seemed to be confined to the centre part of the building, but spread with such rapidity, that before the inhabitants of the adjacent houses could be acquainted with their danger, the flames burst up through the roof, illuminating the neighbourhood, and within a quarter-of-an-hour the building was wholly enveloped in flames. A strong force of men and engines from the County, West of England, and the brigade stations promptly reached the spot, and water being obtained, they succeeded before eleven o'clock in arresting the progress of the flames. Soon after this time a party of four firemen entered the partially gutted house to extinguish some remaining fire, which showed at the back, when the roof and party wall fell, burying West and Weaver of the County fire-office, in the ruins; the former was killed upon the spot, but the latter, after a delay of five hours, was got out alive, but seriously injured. The origin of this fire was supposed to be not accidental, but it remains to this day involved in mystery.

September 18, ½ A.M. Mr. Driscoll's lodging-house, Prussian island, Old Gravel-lane, Wapping. The fire commenced from some unknown cause in the lower part of this house (a very small one of timber), and the inmates escaped with the utmost difficulty. The building was completely destroyed, but six others, to which the fire had extended, were preserved by the timely arrival and prompt exertions of the firemen.

October 11, 3¾ A.M. Mr. Merry, cheesemonger, High-street, Newington Butts. This disastrous fire originated in the shop, and had gained such an ascendancy when discovered, as to cut off the retreat of the inmates, which consisted of Mr. Merry, his brother, mother, and a female servant. The two former escaped from the first-floor windows, but the two latter fell victims to the conflagration. The rapid progress of the flames, and the slight character of the building, caused it to fall in less than three quarters of an hour after the discovery of the fire.

October 4, 1½ A.M. Messrs. Daily and Co., leather-dressers, Bermondsey-street. This fire originated at the back of Messrs. Daily's premises. In a few minutes after the alarm was given, the flames extended to a workshop, and thence to Messrs. Daily's dwelling, the inmates of which had barely time to escape by the roof. The firemen and engines were soon on the spot, but no water could be obtained for some time, and the flames communicated to the patent felt manufactory of Mr. Abbott, next door. In about a quarter of an hour a scanty supply of water was obtained from the Southwark plugs, and a few engines being got into operation, the fire was stopped; Messrs. Daily's premises being completely destroyed, and six adjoining buildings slightly damaged.

October 27, 10½ P.M. Mr. Clitheroe, firework-maker, John-street, Bethnal-green. This house had not been long on fire before a quantity of gunpowder exploded, and blew down the building.

October 30, 10¾ P.M. Small gun armoury, Tower of London. This fire, the most important during the year, appears to have been seen as early as nine o'clock, when a light was observed in the Bowyer tower, but as it almost instantly disappeared, no notice was taken of it; smoke was seen to issue from this part of the building by other parties shortly before ten o'clock. It was not until a quarter before eleven, however, that the appearances assumed such an unquestionable shape, as to lead to the alarm of fire being raised.

"The Cybele of cities stands veiled with the night,
But why are the turrets that crown her so bright?
Those halls which for ages were silent and cold,
Shine forth as when lit for some banquet of old.
But what mean the thunders which peal on the breeze?
Ah! surely no sounds of the revel are these;
The tower hath a guest, though in silence he came,
And the festival there is a banquet of flame."

stounding intelligence spread ra- ad engines from various stations n assembled at the Tower gates, but n was for some time denied them. e the garrison having been roused, er engines (six in number) were ut; but they were in no condition the exigencies of the case, and or- e subsequently given to admit those ere assembled at the western gate. ere immediately drawn up in the alk opposite the principal entrance rmoury, and the firemen led their the grand staircase, with a view of ng to the roof commanding the 'ower, to which the fire was still con- In consequence of the great excite- d confusion which prevailed, how- firemen could not ascertain the access to that part, and in the in- e small quantity of water in the s exhausted.

fter eleven o'clock, the destruction ound Tower was complete, and the ad penetrated into the roof of the . Two of the brigade engines in the building being supplied with others placed near the river, their e engineers entered the Armoury r branches, and directed their jets ceiling wherever the fire showed fter maintaining this position for lf an hour, part of the ceiling fell, ited the roof completely enveloped pon this the firemen retreated, and ely left the room, when the whole iling fell down. Although a gallant s attempted to be made, it was soon that the fate of this building was d the attention of the firemen and came directed to the preservation of e Tower, the church of St. Peter, Map-office, all of which were at this reat danger.

bout half-past eleven o'clock, an it magnificent spectacle presented the eyes of a countless multitude, assembled on Tower Hill:—

terror and tumult from hovel and all
come, for one beacon hath sum- noned them all,
'ar-seen and fire-crested summit, whose glow
fearfully bright on the city below."

plendid Armoury throughout its vast oured forth volumes of flame, the which was reflected from surround- cts through a thick hazy atmosphere zling refulgence. By twelve o'clock, flagration had reached a frightful de, flames were gushing forth from indow of the Armoury, and the heat became so intense, that it was impossible to stand on the broad walk between the Armoury and the White Tower.

The Map-office, which was the corner house on the east side of the square, was fired in the roof by the intensity of the heat, and it was evident that if the flames were not arrested at this point, the consequences would be awful.

The land engines were by this time for the most part placed *hors de combat* for want of water, but the floating engine having arrived from Southwark Bridge, this powerful auxiliary was brought to bear upon the jeopardized buildings with the best effect; the hose being led up to the top of the building, the roof was soon cooled by the drenching columns of water poured upon it, and the fire about the window frames, &c., having been extinguished by buckets of water applied from within, the progress of the flames in this direction was completely stayed. This done, the hose of the floating engine was shifted round to the rear of the armoury, where the Old Mill Barracks and the dwelling-houses in the Mint were now in considerable danger. The floating engine from Rotherhithe having subsequently arrived, it was set to work to cool the burning ruins of the Armoury, and to the presence of these powerful auxiliaries the preservation of the remaining portion of the Tower is mainly attributable. In consequence of the continual rise of the ground from the river, these engines worked at a great disadvantage; the labour to the men was excessive, and the works of the engines and hose were exposed to an enormous strain, while the jet of water thrown from the branch-pipe was powerless in the extreme. Perhaps the legitimate use of these powerful machines under such circumstances is to furnish a supply of water to other engines placed nearer to the fire, so as to be capable of being brought to bear with full effect upon any point that may be required.

By five o'clock, the extent of the conflagration was defined, and all apprehension of further danger was at an end, but the heat within the Armoury walls was so great, as to make it necessary to keep several engines in full work, and in the discharge of this duty one of the brigade firemen (Richard Wivill) lost his life. It appears he was standing a short distance from the Armoury-wall, holding the branch pipe of an engine, when a large mass of brickwork fell, and striking the door way rebounded on to Wivill's head, killing him on the spot. With the exception of Wright (one of the County firemen) who had his arm and some of his ribs broken, this was the only serious accident that occurred.

A lengthened investigation into every circumstance connected with this fire, took

place before a committee of inquiry, but the result of their labours did not fix its origin with any degree of certainty; the general impression, however, is, that it was occasioned by some defect in the flues of the apartment where it commenced.

November 7, 11½ P.M. Mr. Baxter, Hatter, London-street, Greenwich. This fire, which originated from some unknown cause, burned with great fury, and though the local engines were brought to bear as expeditiously as possible, they were unable to hold the flames in check. The distance being upwards of four miles from the nearest brigade station, the London firemen could not reach the spot in time to save any portion of Mr. Baxter's premises, but they were successful in preserving four other buildings to which the flames had communicated.

November 14, 1¾ A.M. Messrs. Kindon and Bathe, floor-cloth manufactory, corner of Wellington-street, Blackfriars-road. No appearance of fire was visible in this building until the flames suddenly burst forth simultaneously from several portions of the roof of the building. A number of engines were on the spot with incredible rapidity, that from Farringdon-street being first, and a plentiful supply of water was obtained both from the Lambeth and Vauxhall mains; but the nature of the building, and the highly inflammable materials which it contained, as well as the extraordinary progress of the fire before discovered, precluded the possibility of saving any portion of the manufactory. The dwelling houses of Mr. Kindon, Mr. Crafter, and others, to which the flames had communicated, were, however, preserved, although ten buildings, in all, were more or less damaged. By five o'clock the fire was confined solely to the fallen ruins of Messrs. Kindon and Co.'s manufactory, to cool which, the engines were kept going all Sunday forenoon. About eight o'clock two of the brigade men, named Parkes and Webb, in direct opposition to the orders of Mr. Braidwood and their foreman, and the remonstrances of their comrades, made their way into the ruins with a branch to extinguish a few embers which showed in the walls; they had not been in many minutes, when the lofty walls on the west side, with the gable end of the south wall, fell inward with a terrific crash, burying the two unfortunate young men beneath an enormous mass of ruins. The most strenuous exertions were made to extricate them, but nearly three hours elapsed before Webb was found, dreadfully crushed and mutilated; Parkes was found in about an hour afterwards, apparently dead from suffocation, no bones being broken.

December 20, 5 P. M. Messrs. Wright and Skelthorp, riggers, Preston's-fields, East India Dock-road, Poplar. These premises, which consisted of timber buildings, were filled with a large stock of marine stores, of various descriptions. The fire commenced in the tarring sheds, which, with the stable, rigging loft, and rope ground, were completely destroyed in a short space of time.

December 25, 1½ A. M. Mr. Lavill, poulterer, High-street, Camberwell. This fire originated, as is supposed, from an escape of gas, in the lower part of the building, and ascended so rapidly, that it was with great difficulty the inmates effected their escape. The firemen were in attendance as quickly as the distance from town would permit, but no water could be obtained for upwards of an hour; at the end of that time a scanty supply issued from the Vauxhall main, but not sufficient to supply one engine! Mr. Lavill's house was completely destroyed, and six others damaged.

Same morning, 8½ A. M. Messrs. Brownrigg and Cockerell, Eagle saw-mills, Old Brompton. The firemen had scarcely extinguished the fire at Camberwell, when they were called to another of a very serious character, (at 6½ A. M.,) in Dacre-street, Westminster, and while there engaged, they received intelligence of that at Old Brompton. The distance being three miles from the nearest station, the saw-mills were consumed by the time the firemen reached the spot: making the twenty-fourth and last fire of this class.

Among the fires at which serious damage was done may be noticed the following, most of which were attended with peculiar difficulties, and called forth a proportionate degree of skill and intrepidity on the part of the firemen.

January 3, 7 A. M. Streatham Old Church. On this morning the metropolis and its suburbs were visited by a terrific storm of thunder and lightning. The first flash of lightning was awful, illuminating the whole horizon, and in its progress struck the steeples of Spitalfields and Streatham churches. Smoke was shortly afterwards seen to issue from the latter, which was soon followed by flames. The parish engine was got out, but the fire was altogether beyond its reach; and a mounted messenger was instantly despatched to town for more efficient assistance. The engines from the Waterloo-road, Southwark-bridge-road, Morgan's-lane, and Watling-street, with an extra supply of leather hose, were started with all possible haste; and notwithstanding the extraordinary state of the roads, from the effects of the storm, they were soon on the spot, and water being obtained, were got to work. A quantity of hose being joined together, and led up into the steeple, the firemen soon brought the engines to bear

e burning pile, with such good effect, the flames were stopped midway, and ork of destruction confined to the upper f the wooden spire.

uary 28, 3½ A. M. Mr. Bundy, trunk-r, 138, Fleet-street. This fire, which urs to have originated from a piece of r projecting into a flue in the back was discovered by one of the City :, who lost no time in arousing the in-s and their neighbours to a sense of danger. The former were extricated ety, and in the first instance sheltered e station-house. The flames raged most sly at the back of the premises, and ding the staircase, entered every room, ich the door happened to be open. The en and engines from Farringdon-street on the spot and at work in less than minutes, the men boldly dashing up tairs with their branches, following the nto every room, until it was completely guished. In this they were ably sup-d by the men and engines from Watling-: and other stations. The *Dispatch*, ing of their exertions, observes:—"The ct of the firemen was beyond all praise; individually exerted themselves, and ntrated their efforts so effectually as to e a mastery over the fire, seldom or before witnessed." The building was y one, of "olden time," with wide ase, and galleries abounding in timber; he great risk the gallant fellows ran, in successful efforts to stop this fire, was nced by the fall of that and the adjoin-uilding, at 10 o'clock at night of Satur-he 27th of February, most miraculously ut injuring a single individual.

bruary 16, 10¾ P. M. Mr. Harlott, te dwelling, Berwick-place, Grange-Bermondsey. This fire, which was d by bringing a candle in contact with ins, burned with rapidity; the firemen ngines were soon on the spot, but an elapsed before even a scanty supply of could be obtained from the Southwark , by which time the dwelling was almost oyed; but a back kitchen was pre-d, by dint of great exertions. This was econd disastrous fire, this day, in the ct supplied by the Southwark water-s, where a want of water caused the de-tion of property to a great amount.

arch 10, 1¼ A. M. Mr. Freeman, beer-, Parsons-street, Upper East Smithfield. only person in the house at the time was ale servant, named Ann Dillon, aged f sober and careful habits. On the fire discovered, and an alarm raised, the en and engines from the Wellclose-e station, (distant only a few hundred ,) were instantly on the spot, and arrived just as the young woman appeared at the second floor front window, imploring assistance. To get at her was beyond all human power, as the flames were bursting forth from the lower part of the house, and extending across the street. Water being obtained, the fire was soon got under, and the unfortunate female found suffocated. The shop and staircase were destroyed, and upper floors seriously damaged.

March 16, 6½ P. M. Mr. Garrard, Loman-street, Southwark, japanner and waterproof leather hat-maker. This fire commenced in the drying-stove, and, from the highly combustible nature of the materials, the flames had gained a great ascendancy before any opposition could be made to them. The engines from the Waterloo-road brigade station, the West of England, Southwark-bridge-road, and others, were prompt in their arrivals, but they laboured under a sad deficiency of water, being for some time dependent on a small supply from Messrs. Lee's yard, opposite. The stove, with its contents, and the finishing shops, were destroyed; but the remainder of the premises, as well as three buildings adjoining, which had ignited, were preserved. This fire was scarcely got under, when the firemen were summoned, at

—— 7¾ P. M., to the South-western Railway Terminus, at Nine Elms. The following authentic narrative of this fire is abridged from the *Railway Times* of March 20. "The premises consisted of a two-story brick building, divided into three compartments; they were situated on the west side of the terminus, at the extremity of the station from whence the trains start. At the time mentioned, the store-keeper and two assistants went into the warehouse nearest the station, which was filled with cotton, hemp, tallow, oil, and other combustible matters, with an open light, which coming in contact with some turpentine from a leaky carboy, the place was instantly in flames. Messengers being immediately despatched, they found Mr. Braidwood and a body of firemen in Gravel-lane, from whence the Watling-street engine was galloped off with all possible speed towards Nine Elms, and was rapidly followed by others. In the interim, a small engine from Mr. Beaufoy's chemical works, and another from Messrs. Burnett's distillery, reached the fire, but they were not accompanied by any person competent to cope with the difficulties which attended their useful application. Most of the persons present seemed so panic-struck, as to be incapable of rendering the slightest service, or of giving such information, as to where water could be obtained, as would enable others to do so. The second division

of the building, used as engineers' workshops, and a depository for stores connected therewith, soon became enveloped in flames; and by 8 o'clock, when Mr. Braidwood arrived, these two portions of the building were one vivid mass of fire, from the roof to the ground. A most disgraceful scene now ensued; there was abundance of water flowing from the Lambeth plugs, in the road opposite the terminus, but the railway authorities insisted on the engines being driven inside the station, where no water could be obtained. Mr. Braidwood was hustled and assaulted, and the operations of the firemen for a time wholly frustrated. While this conflict was going on, the flames were fast extending to the third division of the building, the roof of which was on fire, when Mr. Baddeley ran Beaufoy's engine down to that end of the building, and got it to work from a small tank of water which fortunately happened to be there. Alderman Humphrey, who was present, assisted, both with his counsel and exertions, in this judicious and well-timed movement, which proved eminently successful, the fire in the roof being quickly extinguished, and this portion of the premises was preserved, comparatively uninjured. The railway officials, seeing at last the folly of their opposition to the firemen, were content to permit them to proceed in their own way; their first endeavours were to preserve the carriage department, and the safety of this building having been secured, they then proceeded to the other end of the building, following up the advantage previously gained in that direction.

"It seems to us extraordinary that, in premises of such extent, and containing such an immense amount of property, no local provision whatever should have been made for the suppression of fire; and under such circumstances, we think a little more courtesy might have been expected towards those who came for no other purpose than to render the utmost possible assistance."

April 21, 11½ A.M. Messrs. Graham and Sholt, lucifer match makers. It may perhaps be within the recollection of some of your readers, that these premises were seriously damaged by fire, attended with loss of life, nine months previous. Upon this occasion the inmates escaped with their lives, but the fire raged most furiously; the back part of the premises was entirely destroyed, and the front building preserved with great difficulty, as were three adjoining buildings.

April 30, 9½ P.M. Mr. J. Stewart, St. George's Hotel, Albemarle-street, Piccadilly. This fire commenced in a back bedroom on the second-floor, from a candle having been brought in contact with the bed-curtains; on the fire being discovered the inmates of these extensive premises became panic struck, and instead of making the slightest effort to suppress the flames, persons of both sexes and of all grades were seen running away with the first article they could lay their hands on, to a place of safety. In the interim, the flames spread from room to room, and from floor to floor, until the whole of the double building was one mass of fire. The engines of the brigade, the West of England, and the County, with a strong body of firemen, were soon in attendance, and, after a delay of nearly twenty minutes, a plentiful supply of water being obtained, the premises were completely surrounded, and the spread of the fire stopped on all sides. The greater portion of the Hotel, with its varied and valuable contents, was destroyed, and seven adjoining buildings much damaged.

May 3, 11½ P.M. Mr. Berlyn, dealer in marine stores, Church-lane, Whitechapel. A passer-by perceiving a strong glare of light in the shop, gave the alarm of fire, and with the policemen endeavoured to rouse the inmates to a sense of their danger, but no one appearing, the street-door was broken open, when a mass of flame rushed forth, driving all before it. Almost immediately after this, Mr. Berlyn appeared at the second-floor window with a little girl (his sister) in his arms. The little girl was caught in safety by the crowd, but Mr. Berlyn was less fortunate, he fell heavily on the pavement, and was taken up with both legs broken, and otherwise seriously injured. A female lodger jumped from the second-floor back room, on to some bales of rags in the yard, and escaped unhurt. Another female lodger precipitated herself from the first floor front window without injury, leaving her two boys, aged 8 and 16 years, in the back room, both of whom perished in the flames. No effort was made to obtain the parish fire-ladders, which stood within 20 yards of the burning house, nor was intelligence of the fire forwarded to any of the engine stations. The firemen were not apprised of the fire until it was seen reflected in the atmosphere, and by the time they reached the spot it had attained an alarming magnitude. Water being obtained, the engines were brought into action, but the ill-starred building with its contents was nearly destroyed, and six others seriously damaged before the fire could be wholly got under. About 6 o'clock the next morning the bodies of the unfortunate children were found in the ruins, burned in a shocking manner.

May 17, ¾ A.M. Mr. Bryant, cooper, Broadwall, Lambeth. This fire commenced from some unknown cause in the workshops, which were constructed entirely of timber. The brigade engines from Waterloo-road,

...ngland, were upon the spot ...hort space of time. A plug ... main opposite the gate of ...remises was drawn, but no ...ming. Those of the Lam... were opened with no better ...bout twenty minutes a sup... from the latter, and the ...t to work, the fire was ex... by this time the workshops ...nts were nearly destroyed.

... A.M. Mr. Rodgers, paper... street, Commercial-road, East. ... were very extensive, con... eral large brick buildings, at ... the houses in Berners-street, and ... Back-church-lane. The fire ... the work of an incendiary, ... well executed his diabolical pur... the flames broke forth all at once ... violence. The engines from the ...tions at Wellclose-square, and ...ane, with the County and West of ... were quickly on the spot, and ... abundance. After a desperate ... which lasted nearly two hours, the ... accomplished their task, two-thirds ... being entirely destroyed, and the ... seriously damaged.

...1, 3 A.M. Messrs. Redding and ...men, Castle-yard, Holland-street, ...ars-road. This fire seems to have ... from a spark dropped in the wheel... shop. The flames had gained a ...able ascendancy before discovered, ...uminated the atmosphere for miles. ...thwark-bridge-road, Waterloo-road, ...est of England engines, were promptly ...ndance, and plugs were drawn both ... the Lambeth and Southwark mains, ...twenty minutes elapsed before water ... obtained from either. The conse... was, that the wheelwright's shop was ...med, and the stabling seriously da...d, before any effectual resistance could ...fered to the flames.

...ugust 6, 3½ A.M. Mr. Smith, corn ...chant, the Wheatsheaf Granary, Upper ...mes-street. This fire, which originated ...n the overheated flues of the steam-engine ...ace, suddenly burst forth with a fury ... threatened destruction to the several ex...ive buildings located on this spot. The ...ringdon-street, West of England, Watling-...st, and other engines arrived in rapid suc...ion; and the tide being up at the time, an ...ndant supply of water was obtained both ...n the streets and the river. The float... fire-engine from Southwark-bridge, was ...ght alongside the burning pile, and ...sted materially in stopping the progress ... the fire, which, notwithstanding the ...ngth opposed to it, burned furiously for ...ly two hours. The flames had communicated to the adjoining granary of Messrs. West and Co., and to the front warehouse of Messrs. Rownson and Drew, but both of them were saved from destruction. Mr. Smith's waterside warehouse, the steam-engine, and about one-third of the landside warehouse were, however, destroyed.

October 4, 5 A.M. Mr. Anderson, black horse public house, Kent-street, Borough. This fire began in the lower part of the house from some unknown cause, and when discovered, had cut off the retreat of the inmates. Miss Anderson was lowered from a second floor window by three sheets tied together, which separated in her descent, but she was caught unhurt. Mr. Anderson and his two sons were rescued by the timely arrival of the fire-escape belonging to Bermondsey parish. The engines from Morgan's-lane, Southwark-bridge-road, and other stations, were soon on the spot, and though the Vauxhall and Southwark companies both have pipes laid down, upwards of half an hour elapsed before any water was obtained, and this was supplied by the Southwark main. The building upwards, with its contents, were, in consequence of the delay, nearly destroyed, but the stock in the cellars was saved.

November 12, 11¼ A.M. Mr. Smellie, engraver and copper-plate printer, Bedford-court, Covent-garden. This fire was occasioned by an Arnott's stove in the front kitchen, which was used as a workshop. The fire burnt so rapidly, that some of the workmen had a narrow escape; a young girl was also rescued by Mr. Foggo, (the much respected foreman of the west-end district of the brigade) who brought her down a ladder from the first floor. The engines from the Chandos-street station, closely adjoining, were out and in operation in a very few minutes, but the apartment in which the fire commenced was destroyed, and the rest of the building damaged by heat and smoke; as well as by the water which some misguided workmen at a coach-maker's, next door, poured through the roof, the fire being at the time confined to the basement story.

November 15, 9½ A.M. Mr. Price, firework maker, Charles-street, Curtain-road. At the time stated, Mr. Price, a workman, and two lads, were engaged in their dangerous manufacture, the composition which they were using lying in exposed heaps on benches in the workshop, and an open fire burning in a grate in the apartment, a spark from which it is supposed flew out and ignited the composition. The materials exploded in succession with great violence, blowing out the windows and door. The two men and one of the boys rushed out into the street with their clothes burning; at the same time Mrs. Price, and her sister-in-law, threw

themselves out of the first floor window. The screams of the other poor boy from within the burning building being heard, some humane individuals rushed in and rescued him from the flames with which he was surrounded, but he had received such serious injuries, that he shortly after expired at the London Hospital. Within a very short space of time, several engines had arrived, and by the skilful exertions of the firemen, the flames were prevented from extending to the adjoining houses, but that of Mr. Price, with its contents, was all but destroyed.

December 1, 9 P.M. Mr. Reeve, boot and shoemaker, Princes-street, Soho. This fire, which broke out from some undiscovered cause, burned with such rapidity, that, notwithstanding the early hour at which it occurred, it had nearly terminated fatally to one of the inmates. It appears that Mr. J. Millard, aged sixty-five years, and his wife, who occupied the third floor, finding their escape by the lower part of the house completely cut off, proceeded through a trapdoor on to the roof. Unfortunately, Mr. Reeve's house was about 16 feet higher than those adjoining, and Mrs. Millard dropped on to the next house by means of her husband's cloak, but the infirmities of age prevented him from following her. The fire-escape belonging to the St. James's local society for the protection of life from fire, was soon on the spot, and Mr. Millard was taken off the roof of the burning building unhurt. The following letter was addressed to the Committee of Management of the Society:—

"J. Millard, occupant of the third floor in the house of Mr. Reeve, Princes-street, Soho, boot and shoemaker, burned on Wednesday night the 1st of December, begs to recommend David Clark to the committee, to whom he is indebted for kindly and humanely, at the hazard of his own life, rescuing the said J. Millard from the burning house."

At the society's next meeting, they unanimously voted two pounds to each of the conductors (Dupere and Clark,) for their exertions at this fire.

The prompt arrival of the firemen and engines from the Chandos-street, Crown-street, and other stations, with a plentiful supply of water, led to the early suppression of the fire. But the back part of the house, from the first floor upwards, and the roof, were destroyed.

I have particularised these fires as so many instances of the splendid effects resulting from a well-organised and harmonious system of co-operation; providing, as it does, for the earliest arrival of a force adequate to almost every emergency, in combination with a degree of practical skill and discipline certainly never surpassed. Justice, however, requires me to add, that in the far greater number of minor accidents, of which my limited space forbids the enumeration, and in which but trifling damage has been sustained, still stronger proofs of the practical results of this system are to be found.

The proportions which the *slightly damaged* bear to the whole number of fires is such as cannot fail to reflect great credit upon the servants of the establishment, whose prompt attendance on timely applications being made to them, and the skilful manner in which many of the accidents have been dealt with, have, upon many occasions, confined the damage to a surprisingly narrow limit. So far as the public are concerned, it happens, that the greater number of cases in which the well-judged efforts of the firemen are pre-eminently successful, are unknown, and therefore unappreciated, beyond the limits of their immediate locality.

The following list exhibits the occupancy of the various premises in which the fires have originated; discriminating, as heretofore, between those which began in that portion of the building appertaining to the trade of the occupant, from those which have happened in, and damaged the dwelling-houses only:—

Apothecaries	1
Asphalte works	1
Bagnios	3
Bakers	18
Barge and boat builders	1
Basket makers	2
Beer shops	4
Booksellers, binders and stationers	14
Bottle merchants	1
Brokers and clothes salesmen	3
Builders	1
Cabinet makers	16
Carpenters and workers in wood	37
Chandlers	17
Charcoal and coke dealers	1
Cheesemongers	3
Chemical manufactories	8
Churches	3
Coachmakers	4
Coffee and chop-houses	4
Coffee roasters	1
Confectioners and pastry cooks	2
Coopers	1
Cork burners	1
Carried forward	147

Brought forward	147
1 wick manufacturers..........	1
rs and leather dressers	4
ers	2
rs	21
lters	1
....	1
:-houses	5
ıg stock	4
rk-makers..................	2
ressers	1
cloth manufacturers	1
rs and skin dyers	3
orks	1
blowers (illicit)	1
ies	1
s..........................	6
akers	6
hair merchants	2
and club-houses	6
ers........................	1
black makers................	1
resses	5
r (patent) manufacturers	1
vharfs......................	1
igs	61
: match makers	11
rs	1
ester warehouses	2
: stores, dealers in............	5
ss makers	2
steam	4
ıl instrument makers..........	1
ıa manufacturers	1
rks........................	2
1 colour shops	10
1 baize manufacturers	1
mas	2
Carried forward	328

Brought forward	328
Paper mills	1
Pawnbrokers	3
Printers and engravers..............	2
Printers, copper-plate..............	1
Private dwellings..................	213
Public buildings	6
Rag merchants....................	1
Railways	1
Rope makers	1
Sack makers......................	1
Saw mills, steam..................	3
Schools of industry	2
Shops and offices	25
Shot manufacturers................	1
Ships	7
Ship builders	1
Soot merchants	1
Stables	14
Steam boats......................	2
Steam-engine makers	2
Straw-bonnet makers	1
Sugar refiners	1
Tailors	4
Tallow chandlers and melters........	1
Tanners	1
Tar distillers......................	1
Theatres	4
Tinmen, braziers, and smiths........	4
Tobacco manufacturers	1
Tobaccônists	4
Under repair and building	2
Unoccupied	6
Upholsterers	4
Victuallers	34
Wadding manufacturers	2
Warehouses	3
Wine and spirit merchants	7
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: number of fires on each day of the week was as follows :—

Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Sunday.
109	103	94	80	107	101	102

ir hourly distribution throughout the day and night has been as follows :—

First Hour.	Second Hour.	Third Hour.	Fourth Hour.	Fifth Hour.	Sixth Hour.	Seventh Hour.	Eighth Hour.	Ninth Hour.	Tenth Hour.	Eleventh Hour.	Twelfth Hour.
35	38	24	21	19	14	7	20	14	19	14	24
16	27	16	16	21	26	47	42	79	59	60	38

areful and elaborate investigation *e causes of these fires gives* the *ig result; and it is to be regretted* *numbers known to have been* wilful, and others that occurred under very suspicious circumstances, are so great.

There have been occasioned by-

Accidents of various kinds, ascertained to have been for the most part unavoidable	24
Apparel ignited on the person (2 fatal)	5
Candles, various accidents from	72
Ditto, setting fire to bed-curtains (3 fatal)	76
Ditto, window-curtains	36
Carelessness, palpable instances of	25
Children playing with candles	3
Ditto, fire (1 fatal)	9
Ditto, lucifers	6
Fires, sparks from	13
Ditto kindled on hearths and in other improper places	8
Fire-heat, various applications of, to hazardous manufactures	16
Fireworks, making of (1 fatal)	3
Ditto, letting off	1
Flues, defective	11
Ditto, foul	29
Ditto, overheated	34
Ditto, stopped up	9
Friction of machinery	1
Fumigation, incautious	2
Furnaces, overheated, &c.	12
Gas, various accidents from the escape of (1 fatal)	27
Ditto, carelessness in lighting	9
Ditto, left burning	11
Illumination	1
Intoxication (1 fatal)	5
Lamps, sparks from, &c.	5
Lightning	1
Lime, heating of	5
Linen, airing of	27
Lucifer matches, making	9
Ditto, using	7
Ovens, defective, overheated, &c.	13
Reading and sewing in bed (1 fatal)	5
Shavings, loose, ignited	35
Spontaneous ignition of coals	1
cotton	1
flax	1
hay	4
lamp-black	4
phosphorus	1
rags, damp	3
ditto, oily (1 fatal)	3
rubbish	1
shoddy	1
tan	1
wool	1
Stoves, defective, overheated, &c.	30
drying	6
portable	3
pipe	10
hot air	2
kiln	3
Suspicious (1 fatal)	7
Carried forward	638

Brought forward	638
Tobacco-smoking	22
Wilful	13
	673
Undiscovered* (4 fatal)	23
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In a lecture recently delivered at the Royal Adelaide Gallery, by Mr. Booth, F.S.S., on the fires of London, their causes and prevention, he stated that in a period of five years there were in London no less than 2476 fires. These he divided, as regards their causes, into three classes, controllable, partly controllable, and partly uncontrollable, and after expatiating upon these classes, the lecturer proceeded to observe that, notwithstanding all the vigilance of inquiry that was adopted, there remained a large number of instances in which the causes were unassigned. These he endeavoured to ascribe to spontaneous combustion, observing that certain chemical combinations would take place in bodies, by which heat was elicited sufficient to ignite the bodies themselves, or any substance with which it might be in contact. The series of circumstances under which this took place, was of a very important character, and sufficed to explain many fires of mysterious origin; and what confirmed this view of the case was, that many of the unknown fires originated in those trades in which substances were employed, in which spontaneous combustion was likely to take place. Mr. Booth enumerated fifty-five instances in which spontaneous ignition might ensue, many of which are well known, others of questionable authenticity. He then alluded to the occurrence of fires from very singular causes; amongst these were fires proved to have been produced by transparent substances, acting as lenses, and concentrating the rays of the sun; such as glass globes with gold fish, show-bottles in apothecaries' and chemists' shops, and water bottles in bed-chambers, which had each been known to ignite bed and window curtains. Coarse and blistered glass, used in sky-lights, had caused explosions in gunpowder manufactories; as had also lime, when used in the desiccation of that substance. Lime had likewise, by accidental flooding set fire to many buildings where it

* In thirteen instances, the firemen were not admitted into the premises, and therefore could not obtain any particulars.

ontact with combustible sub-
Under friction, Mr. Booth
o the danger of fire occurring
greve matches, stating that they
le to ignite after they had been
way as useless; the inflammable
was also frequently thrown aside
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their use should be prohibited
ouses and manufactories where
ble matters are kept or used.
the causes of mysterious fires,
to be enumerated the embers of
and cigars, which falling upon
, or being carried to hay-ricks,
ove their destruction, even after
e had elapsed, as they acted like
d, from the nitre which they
l.
g entered thus minutely into a
circumstances, little understood,
guarded against, the lecturer
hat by attention to the published
f fire, great good would be ac-
ed. The number of fires con-
occurring from overheated flues
es particularly demanded atten-
he flues of buildings which had
structed for heating merely by
ole combustion of wood or coal
n open fire-grates, are not at all
be exposed to the intense heat
f by several of the modern stoves.
eat principle of these modern
nces was to obtain and diffuse as
or portion of heat from as small
e as possible, and with the least
otion of fuel; and one of the
was limiting the draught of air.
thus concentrated attains a very
gree of temperature, sufficient to
ny combustible substances with
t may come in contact; besides
the conductile power for heat of
nd plaster becomes much modi-
being constantly subjected to its
e. In this, Mr. Booth considers
great secret of the destruction of
odern public buildings; and the
is of much public importance,
the causes of destruction may,
w, be in slow and insidious ope-
the eventual destruction of other
, and particularly sacred edifices,
e general introduction of new
d stoves into such buildings. It
o, he remarked, *notorious that
isted means of making buildings
f, so that when a fire occurred,*
it might be confined to the apartment in which it originated.

Of the sixteen fatal fires, the following seem to require especial notice, attended as some of them have been by circumstances most distressing to the feelings of humanity, and most disgraceful to the police on duty in the several localities, who have shewn a neglect and want of tact almost incredible.

The first of these fatal fires was that at Mr. Freeman's, in Parson's-street, Upper East Smithfield, 1¼ A.M., on the 10th of March, when a female perished, as before noticed. A coroner's inquest being held upon the body, the following verdict was returned:—"That the deceased, Ann Dillon, was burned to death at a fire that took place on the morning of the 10th of March, but whether it originated by accident, or otherwise, there was no evidence to show."

May 3, 11½ P.M. Mr. Berlyn, dealer in marine stores, Church-lane, Whitechapel. The bodies of the two children, Abraham Weller, and Edward Weller, were found after the fire was extinguished, at the back part of the ruins, burnt in a most frightful manner. A coroner's inquest was held the same evening, and after a lengthened and unsatisfactory investigation, a verdict of accidental death was returned.

June 8, 4½ A.M. Astley's Amphitheatre, Westminster-bridge-road. Mr. Ducrow having been roused to a sense of his danger, he instantly collected his family and servants, and escaped with them in their night clothes: they first ran down stairs to the entrance leading to Westminster-bridge-road, but being unable to open that door, they retraced their steps, and descended a back staircase, amid clouds of dust and smoke, into the court-yard leading into Stangate-street. One of the female servants, named Elizabeth Britton, who had lived with Mr. Ducrow for many years, and to whom he was much attached, after escaping, was so imprudent as to return, under a vain hope of saving (as is supposed) her clothes, and was never again seen alive. After the fire was over, her blackened remains were found in a crouching position behind the door of the box entrance. The coroner's inquest returned a verdict that the deceased, Elizabeth Britton, was accidentally burned to death by going into Astley's Theatre, which had taken fire by accident." The loss of his property, and the melancholy death of his beloved servant, had such an effect upon Mr. Ducrow, that he never recovered the shock; his health fluctuated greatly, till February, 1842, when he suddenly expired.

July 2, 11 P.M. Mr. Reilly, chair-maker, Quicksett-row, New-road, Maryle

This fire was supposed to have been occasioned by one of Mr. Reilly's workmen, who lodged in the house, and returned home about 11 o'clock in a state of intoxication. He retired to his room, from which he never came forth alive, but perished in the funeral pyre he had unwittingly kindled, dying a most dreadful "drunkard's death."

October 11, 3¾ A.M. Mr. Merry, cheesemonger, High-street, Newington-butts. At the coroner's inquest on the bodies of the two sufferers, Mrs. Merry, and the maid-servant, Police constable 198 P said, "*If I had known that the ladders were nearly opposite the fire, where I have since seen them, I think the old lady's life could have been saved!*" Another policeman, 246 P, stated that, "*when he entered the police force, he was not told where the fire-escapes were placed!*"

It is a fact, that the parish ladders stand nearly opposite to the ill-fated building, and the spot is indicated by an inscription in legible characters stating where the keys are to be obtained. How ignorance of the circumstance could possibly be pleaded, seems passing strange. The parish engine from the same spot was soon brought out, for the sake of the reward; but there was no person present competent to set it to work, and the bringers were too much ashamed to apply for the reward, which was given to the West of England, the next to arrive, and the first to work on the fire. The jury returned a verdict of "Accidental death," at the same time expressing their regret "that the police were not acquainted with the place in which the parish ladders were kept, as they might have prevented the sacrifice of human life." It was also determined to memorialize the commissioners on the subject.

Three fires, as already narrated, proved fatal to firemen; one terminated fatally from a sudden explosion of gunpowder; four were fatal to children from the ignition of the beds on which they lay; and three from the ignition of wearing apparel on the person.

The most extraordinary case of burning that ever came within my knowledge, is set forth in the following narrative from the Weekly Dispatch of May 9th last, which proves

"———— how frail we are,
How short our life, and how uncertain
The means that bring us to our end!"

"*Singular Case of Burning.*—On *Monday, an inquest* was held at the Ormond's Head, Princes-street, Storey's-gate, Westminster, before Mr. Higgs, Coroner, on the body of Charlotte Furneaux, aged 16 months, whose death occurred under the following circumstances:—Frances Furneaux, sister to the deceased, stated that on Saturday morning she and the deceased were out walking in Tufton-street, when suddenly the upper part of her clothes burst out in flames. Witness cried out for help, and several people immediately came to the deceased's assistance. Deceased had no combustibles in her hand or about her dress, nor was there any one near who could have set her clothes on fire. Thos. Parry, of No. 12, Chandos-street, coach-painter, stated that he was at work on the morning in question, at No. 57, Tufton-street, and hearing screams he looked out of the window and saw deceased in the street in flames. He and other persons from the neighbouring houses rushed out and extinguished them by throwing carpets, &c., round deceased. She was most dreadfully burnt, and he instantly conveyed her to the Westminster Hospital. There was no one near who could set fire to her clothing. She had on a black pinafore, but there was nothing at all remarkable about the other materials of her dress. C. H. Garstin, Esq., house-surgeon to the Westminster Hospital, stated that deceased was burnt in a most horrible manner, and it was utterly impossible that any medical skill could have saved her life. She died in great agony on the following morning. The jury returned a verdict of 'Death by burning,' there being no evidence to show how the combustion of deceased's apparel had originated."

In my last report, I noticed the formation, in June, 1840, of a local society for the protection of life from fire in the parish of St. James's, Westminster, in consequence of the sad calamity which had then recently occurred by the loss of two lives at a fire in Marylebone-street. This society (all the officers of which, including their indefatigable secretary, Mr. W. J. Newton, are honorary) has been in full operation during the last eighteen months, with the most gratifying success.

The principal fire-escape of the society (one of Wivell's) is deposited during the day in Argyll-place, and every night, at half-past eight o'clock, is placed in charge of the conductor, on the south side of

quare, prepared to proceed, at it's notice, to any part of the : its vicinity where a fire may it. The conductor, with his has been in attendance, during s of duty, at thirty-three fires; of which have occurred in St. and thirteen in adjoining pa-

even of these fires he arrived minutes before the turncock or and in fourteen instances he simultaneously with the first en- n three instances he succeeded guishing the fires before any other e arrived; and, upon one of casions, he was presented with a a as a reward for his prompt and services, by the British Fire who had an insurance upon the . At one fire (Mr. Reeves', in street), the society's servants d in saving the life of a fellow- , as already noticed; and the have the gratification of knowing loss of life by fire has occurred their district, since they com- operations. In addition to the above alluded to, the society have l a sliding ladder escape at the d of the Burlington Arcade, as two portable rope escapes, one at thouse entrance, No. 50, Poland- he other at the residence of the , No. 41, Brewer-street, Golden-

y last report, I alluded to the n which had been produced in by the occurrence of some fatal ended with a serious loss of life, ircumstances most disgraceful to horities. I also described in he measures which had been ip to that period, with a view to a repetition of such calamities. now only to bring down the nar- the present time. On the 24th y, the Police Committee, with D. rvey, Esq., the Police Commis- and Mr. Braidwood, the Super- nt of the London Fire Establish- met at Guildhall to receive and the very excellent fire-escapes had been made agreeably to their a notice of which meeting duly d in your 916th Number.

r these escapes had been examined mired, they were deposited in a *amp hole at the back of* Guild-hall, known as the "kitchen," where they have remained ever since, rapidly undergoing the decay that appertains to all sublunary things.

I have only to add the fact, that the makers' bills have been paid, and so ends

"This strange eventful history."

During the past year the deficiencies of the water supply have again been most seriously felt in several localities, especially in the neighbourhood of Bermondsey, where a timely or adequate supply can scarcely ever be relied on. In several other districts, however, similar misfortunes have likewise been experienced, and the whole question is now before Her Majesty's government, in order to ascertain if this highly important matter will not admit of some systematic improvement, by which a prompt and sufficient supply of water may be insured upon every occasion of fire.

In my last report I mentioned that an improved marine fire-engine was building for the Emperor of Russia, by Mr. Merryweather. During the past summer this magnificent machine has been completed, and now floats on the waters of the Neva, affording the protection of its immense power, in case of fire, to St. Petersburgh and its environs.

Fig. 1, (see front page) is a side elevation of this marine fire-engine, from a drawing taken at St. Petersburgh; and fig. 2 is a ground plan of the boat and machinery. It consists of a fine iron boat, 60 feet long, and 16 feet wide, constructed by Messrs. Fairbairn and Co., of Blackwall. The engine has three working barrels, A, 7¼ inches in diameter, with a 14¼ inch stroke. Manual power is applied to four cranked handles, H, 12 feet long, and 18 inches radius, which are connected by toothed gearing with a main shaft, C, carrying three 6-inch cranks. Connecting-rods, *d*, pass up from these cranks to three over-head levers, E, the fulcra of which are placed in the back part of the frame, behind the air-vessel, B: the other end of the levers being attached to the piston-rod slings. Each pair of the cranked handles is provided with a fly-wheel, W, 6 feet in diameter, to equalize the motion, and the handles, H, are all fixed at angles of 90° relatively to each other.

The engine occupies the middle of the boat, both ends of which are alike, to su-

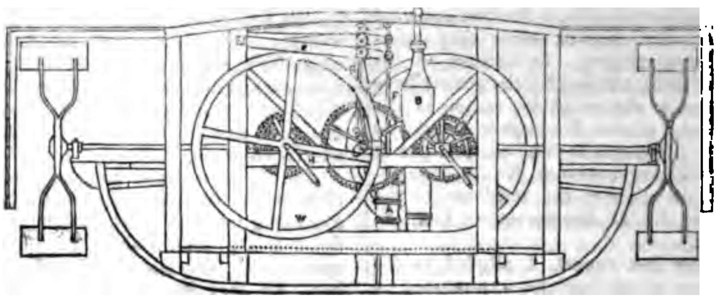
persede the necessity of turning round: and about mid-ships are placed two paddle-wheels, P, the paddle-shaft, carrying bevelled wheels, to admit of its being connected by sliding-gear with the cranked handles, when they are disconnected from the pumps.

The prefixed engraving is a side elevation of the engine, showing the situation and arrangement of the cranks, levers, &c.

A, is one of the three working barrels, all of which deliver their contents into the air-vessel, B. C is the main crank-shaft from which the connecting-rod, *d*, passes up to the over-head lever, E. F is the piston-sling, the piston-rod working in a guide fixed on the top of the cylinder, A. On the upper part of the air-vessel, B, there is a revolving T-piece, carrying two male-screwed nosels, to which two separate lines of leather hose may be attached, or, if it is preferred to work but one more powerful jet, the second orifice is closed by a screwed cap. When a single stream is delivered, the jet may be 1 inch, 1⅛, 1¼, or 1⅜ inches in diameter, according to the elevation required, with a nose-pipe 1¼ inches in diameter; the height reached is about 120 feet, or 136 feet horizontal. If two jets are employed, nose-pipes ⅞ths of an inch in diameter are used.

The working of the pumps, levers, &c. is exceedingly smooth and steady—that of the toothed gearing remarkably so; there is no shake or rattle in any part of the machinery, and the presence of toothed gearing cannot be detected by the ear. The streams of water are beautifully compact and steady, and capable of being directed with great precision.

From the circumstance of some mis-



calculations having been made, with respect to the propulsion of the boat, either by underrating the power, or overrating the resistance, the speed at first attained was by no means satisfactory, being little more than six miles per hour; but the manual power was so greatly in excess, that when paddles of a proper size have been fitted, there is no doubt that a speed of upwards of eight miles an hour will be realized, without any particular exertion on the part of the "rowers." The rapidity and ease with which the power of the men could be transferred from the *paddles* to the *engines*, and *vice versa*, greatly astonished all who saw it.

The signals, "ease her," "stop her," the shifting of the gearing, and the order to "go on," have been frequently completed within one minute.

The Sovereigns of Prussia and of Russia have now, the one the finest *steam fire-engine*, the other the finest *marine fire-engine* in the world.

The exertions of the West of England firemen, under their excellent foreman, Mr. Connerton, continue to merit especial notice. The promptitude of their attendance may be very well illustrated by mentioning that, in upwards of fifty instances, they have shared the rewards for early arrival, which are only allotted to the first three engines—including among these, their attendance at Camberwell (twice,) Deptford, Greenwich, Blackheath, Islington, Hammersmith, and

listant places. Their zeal and in getting to work, on arriving :, have been fully equal to their ion in reaching it; and there have :w fires of any magnitude in the olis, at which the West of England remen have not borne a conspi- part, and greatly distinguished lves. The West of England ny are particularly fortunate in :rvants, as their good success is by .ns confined to the metropolis. At , Glasgow, and in many provincial their achievements have called the warmest eulogiums of the press. Upon the occasion of a fire at the extensive cotton spin- orks of Messrs. Bartholomew and : Barrowfield, near Glasgow, the of England men won "golden is from all sorts of people." These ve works were discovered to be on ortly before three o'clock A.M., on 'd of November last. Information mediately sent to the Fire Police sgow, but from the preremptory given to Mr. Robertson, the su- ndent of the Fire Establishment, Glasgow Police Board, "that he t on any pretence whatever, to go ', or allow his men or engines to t, beyond the bounds of the Roy- he could not move in the matter. oner was the alarm of fire re- in Glasgow, however, than the d engine of the West of England and their fire brigade, proceeded spot as fast as horses could take and rendered the first and most t assistance. The *Glasgow Con- mal* remarks that, "the rapidity 'hich the engine of the West of id Company was brought forward, ivity, industry, perseverance, and ness of the brigade attached to it, the approbation of all concerned; ough no part of the building or vas insured with that office, Mr. iw, the agent, was present during iole period, lending every assist- i his power."

West of England engine was fol- by that of the Anderston police, from the city, and one from the ' barracks most admirably manned irty of artillerymen. These were uently reinforced by the two en- f the Glasgow Fire Police, which *rd Provost eventually forwarded wn responsibility.*

The paper already quoted, commenting on the refusal of the Glasgow Police Board to send out their engines when a fire is raging, destroying thousands of pounds' worth of property, and throwing hundreds of work people into a state of starvation, observes "They are not required —no one has ever required them—to send their engines beyond the police boundaries for nothing. The very Act of Parliament which places the fire department under their control, gives them undoubted powers to recover the expense incurred in extinguishing fire beyond the Royalty; and yet, with this guarantee, with the additional guarantee of the proprietors, and the official and personal guarantee of the Lord Provost to back it —with a recklessness of life and property, *unequalled, we may safely say, in any civilised society*, they direct their superintendent to refuse assistance, whatever may be the obvious destruction to follow from their dogged and unjustifiable conduct!"

The year just ended has been one of great fatality to the firemen. The first victim to the perils of his calling was M. West, aged 33, a fireman of the County Fire Office, who was killed by the falling of part of the house of Mr. Salmon, in Piccadilly on the 12th of September, as already described. West was a most skilful and intrepid fireman, and had, on many occasions, particularly distinguished himself; his exertions at the House of Lords, at Hatfield-house, and elsewhere, have been duly recorded in your pages. The day of his death was also the anniversary of his birth, and West had been unusually low-spirited and melancholy throughout; whether from a presentiment of some approaching calamity, or from the meditations which the return of his natal day suggested, is known only to Him "from whom no secrets are hid." West's wife, who was near her confinement, had a strong presentiment of her loss, declaring in the morning, when he did not return with the other firemen, "that she had seen him at her bedside in the course of the night, and that she was confident he was no more."

On the Thursday following, the remains of West were deposited in the cemetery established by the late Barber Beaumont, Esq., (the founder of the County Fire Office) at Mile-end.

The burial service was read by the Rev.

Dr. Croxton, who, after its conclusion, delivered an impressive and eloquent address to the firemen present, touching upon the excellent character which the deceased had maintained, as an example to them, and also on the arduous duties which firemen generally have to perform; earnestly exhorting them to prepare for a future world, none of them knowing how soon they might, like their late companion, be called into eternity.

Mr. Beaumont, the present owner of the Cemetery, gave the ground. The expenses of the funeral, and of a tablet to be erected to the memory of the deceased will be defrayed by the County Fire Office, by which, also, an annuity, with a residence, have been provided for the widow.

In little more than a month afterwards, viz., on the 31st of October, Richard Wivill, (aged 23) a junior fireman in the London Fire Establishment, was killed in the discharge of his duty at the Tower, as already narrated. Wivill was a good, though young fireman,, and bore a most exemplary character; he was unmarried, and was the principal support of an aged mother. His remains were buried on the Sunday following that on which he died,* at St. Saviour's, Southwark, with all the honours that admiration of his conduct and sympathy for his melancholy fate could suggest.

On Sunday, the 14th of November, Joseph Parkes, aged 25, and William Webb, aged 24, fell victims to their own imprudence and disobedience, at the fire, which destroyed Messrs. Kindon's floorcloth manufactory, in Blackfriars-road, the particulars of which are before recorded.

It is painful to reflect, that in each of these cases the heat of the battle was over, the victory completed, and all occasion for exposure to danger removed.

On the following Sunday, the remains of the two unfortunate men were interred in one grave, at St. George's, Southwark, with the same honours as they had assisted to pay their deceased comrade only a fortnight before.

The bereft mother of Wivill received a donation of 20*l.* from the Board of Ordnance—6*l.* from the officers of the Scots Fusileer Guards, per Col. Eden—and 1*l.* from Mr. Robarts, the Banker. The widow of Parkes received a donation of 25*l.* from the Committee of Management of the London Fire Establishment, and Webb's widow a similar sum; in addition to which, Mrs. Webb also received upwards of 6*l.* subscribed for her by the constables of the M division of police, as well as other sums from private sources.

The London Fire Establishment, (managers and men) are also straining every nerve to get Webb's infant son (two years old) into the Infant Orphan Asylum at the forthcoming election in April; and it is most sincerely to be hoped, that their benevolent efforts will be crowned with well-deserved success; when that is done, it is understood the child's board, from the time of the accident till its admission into the asylum, will be reimbursed by the Establishment.

It is also right to mention, that every expense incident to the three funerals, including mourning, has been defrayed by the Committee of Management of the London Fire Establishment.

All the machinery of the Establishment continues in excellent order, and the efficiency of the men, from Mr. Braidwood, the superintendent, to the last junior fireman, continues to promise the utmost protection that bravery and skill can accomplish.

There are among them, those, who, under the protection of an all-wise and overruling Providence, have grown hoary in this perilous calling; may His omnipotent arm still watch over and protect them, amidst every danger, is the sincere prayer of

Sir, your obedient servant,

William Baddeley.

29, Alfred-street, Islington,
February 21, 1842.

NATURAL LINEAR STANDARD.

Sir,—May I request you will submit to the judgment of your more learned readers the following—

Proposition:

The steel-yard with arms as 1 to 4, being retained in equilibrio by weights which are as 4 to 1, is balanced, also, by a body one-fourth the less weight let fall on the end of the longer arm when its momentum has quadrupled its own weight. The length of the fall is a fixed quantity, and always obtainable under equally proportional circumstances.

Fig. 1

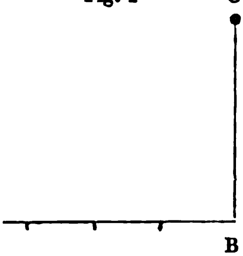
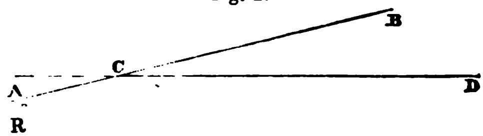


Fig. 2.



, A, a body of unknown weight. ourth of A; C, one-fourth of B; nomentum at B = B the counter of A. The length of descent :s the standard of linear measure. 2, Adjustment of the beam for . proof. A, the greater weight, R ; C D angle of elevation.

One-fourth of C B for commercial linear measure.

One-fourth of C B the side of a cube for liquid measure.

One-fourth the weight of the full contents of the cubical measure of distilled water for scale weight.

T. PASLEY.

Jersey, January 31, 1842.

LAW OF WHEELS.

; Birmingham Public Office a case lerable importance to carriers and ectors lately came on for hearing '. T. Lawrence, Esq., and Dr. It was a complaint by Mr. Robert , agent to Messrs. Pickford and Co., nsive carriers, against John White, l keeper of Spark Brook turn- demanding and taking from Daniel . one of Messrs. Pickford & Co's. wag- '5 more toll than was authorised by The wagoner refused to pay the de- s demand, and the latter seized one orses, which he afterwards sold, ap- ing the money in payment of his . . Mr. George Edmonds appeared srs. Pickford, and said, that on the :., two caravans, constructed with and loaded with goods, went through ıpike gate at Spark Brook. They :en over the machine and were found er weight. The only question, how- s, not as to the weight of the wagons, was agreed to on both sides, but as mount of over weight which the act to vehicles of this description. The ıt alleged that 3 tons 5 cwt. was all ey were entitled to carry, and the nants, on the other hand, contended y were entitled to 3 tons 15 cwt.,) cwt. more. For this weight Messrs. l had tendered the proper amount of l all that they required the magis- o decide was, which of the parties ght in their construction of the act. lmonds then proceeded to direct the ı *of the magistrates to the acts of* *at regulating the amount of* goods to be carried by certain descriptions of wagons. The 3rd Geo. IV., c. 126, sec. 12, created a graduated scale of weights to be allowed in summer and winter respectively to two classes of carriages therein mentioned; the first of which he should designate as "broad wheels," or such as had wheels of the width of 4½ inches and upwards, and the second he should call "narrow wheels," or such wheels as were under 4½ inches. The weight allowed to be carried by the first description of carriages was 3 tons 15 cwt., and upwards, and for the second class 3 tons 5 cwt. The carriages spoken of in the 12th section were called wagons, wains, and other four-wheeled carriages, but in the 13th section a new class of carriages was introduced, which, in order to distinguish them from the former description of carriages, were called "caravans or other four-wheeled carriages for the conveyance of goods, and built and constructed with springs," and to those carriages 3 tons 15 cwt. was allowed in winter, without reference to the width of the wheels. Upon these two sections alone it was admitted that the carriages in question came within the latter description, (the 13th section,) and would be entitled to carry 3 tons, 15 cwt.; but an act 3 and 4 Wm. IV., c. 81, was passed, which, as was contended by the toll collector, repealed the privilege of the extra 10 cwt. allowed to spring carriages, and put them under the 12th section, in the same class as common wagons. The act 3 and 4 Wm. IV., after reciting the two sections of the 3rd Geo IV., already mentioned, and stating also that doubts had arisen whether the 13th section (that allowing to all spring

carriages a fixed weight of 3 tons 15 cwt. without reference to the width of the wheels) might not extend to all wagons, &c., if on springs, although if not on springs they would be comprehended under the other section, and might be allowed a graduated weight up to 6 tons—then enacted that the said 13th section of Geo. IV. "should not extend to wagons, &c., having the felloes of the wheels thereof of the breadth of not less than 4½ inches at the bottom or sole thereof, notwithstanding the same may be built and constructed with springs." Mr. Edmonds contended that this clause did not apply at all to wheels of less than 4½ inches but left them entirely under the 3rd Geo. IV. the act of William applied to wagons of not less than 4½ inches; that was, of a width of 4½ inches "or more, and which would come under the designation of "broad wheels." Supposing, for instance, a spring carriage to have wheels of 9 inches in width, under the 12th section of Geo. IV. such carriage would be allowed 6 tons, but if placed under the 13th section it would only be allowed 3 tons 15 cwt. The act of William therefore declared that the 13th section should not apply to the broad-wheeled spring carriages, but that they should be entitled to the extra weight allowed by the 12th section ....The description of the caravan, and the width of the wheels, with the weight of goods carried, were proved by Camden, the wagoner; and Mr. Howson also deposed to having tendered to the defendant the amount of toll to which he considered him legally entitled, before the horse was sold, and which he refused to accept. The magistrates having consulted for a few minutes, Dr. Melson said that the 13th section clearly entitled the complainants to the extra 10 cwt. The ambiguity in the act of Wm. IV. appeared to him to arise from the introduction of the second negative in the sentence already quoted, namely, "should not extend to wagons, &c., having the felloes of the wheels thereof of the breadth of *not less* than 4½ inches," &c. If the word "more" had been substituted for the words "not less," the meaning intended would be more clearly expressed, viz., that the clause allowing the fixed weight of 3 tons 15 cwt. should not extend to wheels of more than 4½ inches, or "broad wheels." The wheels in the present case being "narrow wheels," the weight was entirely regulated by the 13th section of the 3rd Geo. IV., and the 4th William IV. did not apply to them.—The defendant said that himself and his fraternity had always read the act differently, and had so acted upon it. —The magistrates ordered the defendant to refund the overcharge, amounting to 5*l*., and *to pay, in addition, the expenses and loss incurred by Messrs. Pickford*, in the detention and keep of the horses while in his custody, amounting to 2*l*. 13*s*.—Mr. Edmonds then applied for the infliction of a penalty which the act left at the discretion of the magistrates. He did not wish for any heavy fine, but as the Messrs. Pickford were not required to pay in similar cases on any other road they travelled, he thought that some trifling penalty was necessary, in order to mark the magistrates' opinion of the case.—The defendant pleaded his inability to pay, and also exemption under a clause in the act.—The complainant ultimately agreed not to press for a penalty, upon the understanding that every matter relating to the question should be considered as settled by the decision of the magistrates. To this proposition the defendant agreed; and Dr. Melson said, if a similar case again arose, the magistrates should certainly inflict the full penalty of 5*l*.—*Midland Counties Herald.*

ON THE CAUSES OF INJURY TO BOILERS. BY C. W. WILLIAMS, ESQ.

Sir,—In following up the subject of the conduction of heat through metallic plates and bars, my object is to show how intimately connected are the scientific details of the subject, with the amount of evaporation effected, or of injury sustained, by a judicious application on the one hand, or any derangement on the other, of their conducting powers. That the causes of such injuries have not been sufficiently inquired into, is evident from the unsettled state of the question, and the absurd and contradictory causes to which even some practical men attribute them. Among many instances, I may mention the following. In one case, a boiler was seriously injured, and the premises set on fire, by the overheating of the plates, even to redness, in consequence of an accumulation of deposit within (above four inches thick), and which, after an interval of rest, had become consolidated on the bottom, as described in my former communications. This indurated mass being a bad recipient, and worse conductor of heat, prevented the access of the water to the plates, and thus caused the overheating. This injury, however, was very learnedly attributed to the generation of a combustible gas in the boiler, and which, on exploding, was supposed to have occasioned the setting fire to the premises. Yet, all this while, no reference was

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been overheated: some plates
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new riveting and caulking.
accidents of this sort are of
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nary expanding and contract-
e, under an ingeniously sup-
nate heating and cooling pro-
otwithstanding the entire bot-
es were exposed to an uniform
eated products of combustion
urnace, the theory assumed
was a body of air at one time
flame against the boiler bottom
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even to a considerable extent;
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ended by Mr. Armstrong, to
above ingenious theory of ex-
d contracting is attributed.
ractical men will thus strain
nd speculative sources of in-
they overlook natural and
uses, it is time that further
made, and the subject taken
hands of quacks and pretend-
loser view of the principles
ically govern the conduction
ugh metallic bodies, will help
those erroneous notions, and
bring the question within narrower and better defined limits.

Hitherto, I have examined the subject with reference to the illustrations which practice presented: I will now draw some from the statements of others.

"If a metallic bar," says Professor Brande, speaking of conduction, "be placed in connexion with a constant source of heat, and we wait till it has taken up a *permanent state of temperature*, we shall find that for distances from the source, taken in arithmetical progression, the excess of temperature above the surrounding medium, will form a geometrical progression."

We have here a defined connexion between those rates of progression, and a "permanent state of temperature" in the conductor bar. Now this "*permanent*" state corresponds with what I have termed the *statical* heat of the bar, and which indicates the degree in which the metal will be affected by heat, injuriously or otherwise. When Mr. Brande uses the term "permanent state," it is not to be taken as referring to any particular temperature, but merely to the condition (as to temperature) in which the conductor may then be placed; and only *cæteris paribus*, as regards the surrounding state of things; inasmuch as each, and every change, will induce a new and varying state, or statical temperature. This, however, will be more apparent as we proceed.

The point now under consideration is this, how far the nature of the recipient will influence this permanent state of statical temperature? The bar and its state, as mentioned by Mr. Brande, we see had reference solely to one kind of recipient for the conducted heat, namely, the air. If, however, it be brought into connexion with a different class of recipients, as oil, mercury, or water, a new and different *pro tempore*, though "permanent state," will be established. In other words, the statical heat will vary as the circumstances which govern it, and which I am endeavouring to show are solely attributable to the nature and properties of such recipient.

What then are the circumstances which modify or govern the statical heat? I here prefer using the term *statical*, rather than *permanent*, as it avoids confusion, and, without any apparent contradiction, involves the idea of a temperature, though still defined, yet varying

according to circumstances. This statical heat, then, must be considered under two relations, namely, as indicating, first, the amount of power exercised by the recipient in carrying away the heat received from the conductor, and secondly, the amount of influence which such power exercises on the conductor itself.

With respect to this direct connexion I find but little notice has been taken. Professor Kelland, of Cambridge (now of Edinburgh), has however, in his "Theory of Heat," distinctly recognised it as demanding attention. Under the head "Convection," he observes, "A mode of loss of heat analogous to conduction, is that to which Dr. Prout has applied the term *convection*. When a hot body is in contact with the air, the part next the body becoming more elastic (rarefied), flies off and is supplied by colder portions; thus the heat of the body is conveyed away more rapidly than it would be if the air were not in motion. It is obvious that this circumstance will materially affect all experiments on the motion of heat, in which it is hardly possible to estimate the effects due to this cause." Now it is this very circumstance, as it affects the condition of the metals employed in evaporative processes, that I am desirous of examining; inasmuch as this "convection," or carrying away, as the term imports, will, in practice, be found to be the primary source of good or evil. Conduction being but the secondary, or induced cause.

Professor Kelland, further on, in examining the mode by which heat is transferred from one part of a body to another, observes, "When speaking of solids, this is called *conduction*. It is clear, from the term itself, that we do not include, under this head, the transfer of heat by *radiation*; nor do we include that transfer which takes place amongst the particles themselves, carrying with them the caloric they have acquired, which we designate *convection*." It is manifest from this clearly defined distinction between conduction and convection, that as the former refers to solids, so the latter refers to fluids—aeriform or liquid; inasmuch as the "carrying with them" the caloric they have received, involves a mobility among the particles which is inconsistent with the nature of solids, while it is a correct definition of that of fluids.

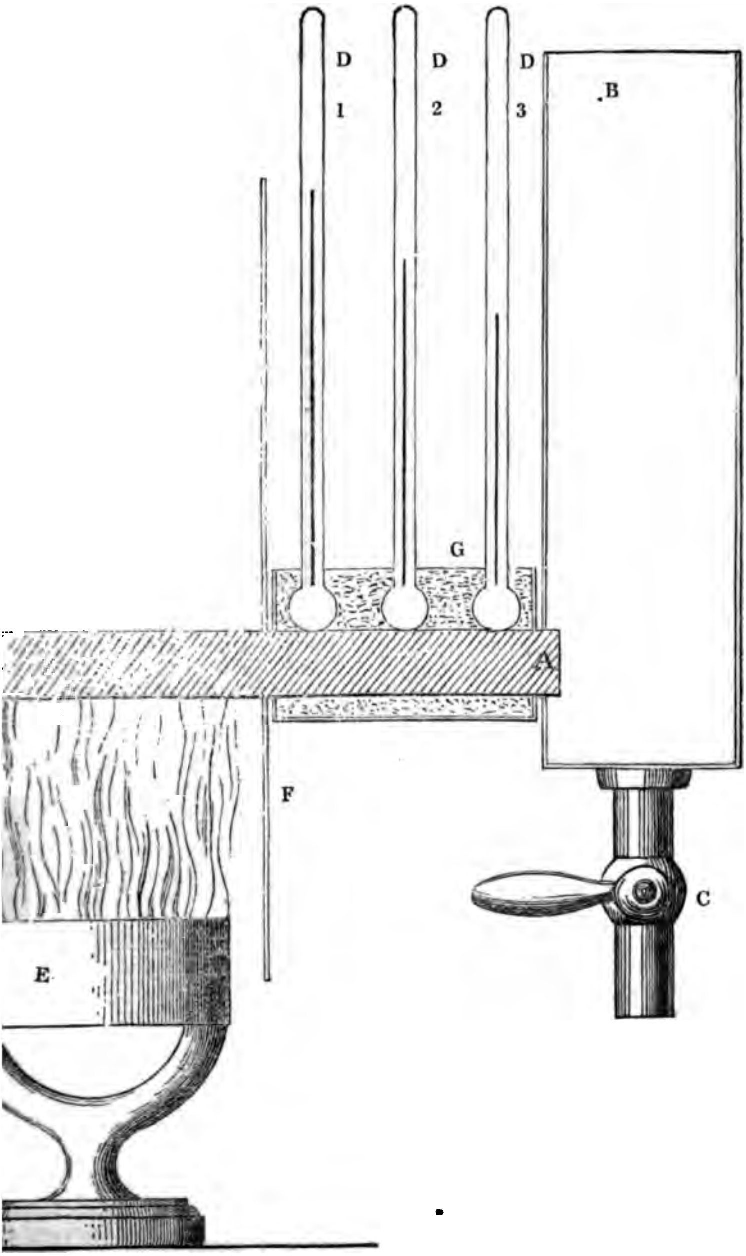
Practically speaking, then, this distinction is peculiarly applicable to our present inquiry, the whole turning on this point, whether conduction or convection be the prime mover in producing those fluctuations of temperature in the conductor which lead to useful or injurious results. Let us now examine, practically, the effect of this convection, or power of carrying away the heat, and the extent to which it influences the heat conducted, both as regards quantity and rapidity.

Let us suppose that a given quantity of heat is passing through a metallic bar, with a rapidity due to its maximum power of conduction; and that it is taken up, or absorbed, by the recipient, with a corresponding rapidity. The temperature of the conductor will then truly indicate that permanent state, referred to by Mr. Brande. If, however, this absorbing power on the part of the recipient be diminished, the rate at which the heat passes from the conductor will also be diminished in the same ratio; and as a necessary corollary, the rate of the current of heat through the conductor will be reduced in a corresponding degree. The practical question then is, to what extent will this "permanent state" or statical temperature of the conductor be affected by such diminished power of convection in the recipient; for this statical heat will ever influence the question whether such conductor be under or overheated. The following experiment will illustrate some of the relations which affect this inquiry.

The annexed engraving, it will be seen, exhibits a state of things, corresponding in principle, to that referred to in your Number 967, in which the thermometer indicated the statical heat of the conductor bar. I have now extended the illustration by lengthening the bar and introducing three thermometers, thus, to indicate the heat at three different sections, and mark more accurately the varying temperatures.

In this engraving, as in the former one, let A represent the conductor bar; B the vessel to contain the recipient, water, or air, or whatever it may be; C the cock for letting off the liquid, when employed as a recipient; D 1, D 2, D 3, the three thermometers, indicating the statical heat at their respective portions of the bar; E the constant source of heat, being that from a powerful gas-burner, furnished with a metallic dome, on the

C. W. WILLIAMS'S HEAT CONDUCTOR BAR.—(ILLUSTRATIVE OF STATICAL AND DYNAMICAL HEAT.)



principle of the "Solar Lamp;" and F, the protecting shield. To these I have now added the chamber G, which was filled with charcoal powder, to act the part of a non-conductor. By this means, radiation from the bar was prevented; the thermometers received heat alone from their points of contact with the bar —the internal streams of conducted heat being confined, as though it were water in a canal or tube.

By the following table, No. 1, we find that in fifty minutes the water in the vessel B was raised to the boiling point, by the issue of what I have called the stream of dynamical heat, from the end of the bar at A. A "permanent state" of temperature was then attained; the thermometers at their respective distances from the source of heat, in arithmetical progression, indicating the temperatures, in geometrical progression, (or sufficiently near for our purpose, for accuracy in this respect was not attempted), of 400°, 309°, 242°,—the extreme difference being 158°. Let us now suppose this to be the state of things in which the *maximum* power of conduction of the metal was brought into action. It is here manifest that the amount of statical heat in the conductor will bear some ratio to the joint power of conduction in the bar and convection in the recipient water.

On the recipient being changed, by letting out the water and letting in the air, a new state of things is induced. The power of convection will be diminished, (air being a worse-recipient than water); the quantity of heat received from the conductor in each unit of time will also be diminished; and the rate at which the stream of conducted heat passes through the bar will be influenced in a corresponding degree. The source of heat, however, remaining constant, the inevitable result is that accumulation will take place in the bar, and the thermometers instantly indicate an increase of statical heat. This I believe to be the *rationale* of the process, and this is exactly what we find confirmed in practice. Now, if the velocity of the convection of the new recipient, air, be ascertained, as well as the conductive power of the metal bar, and both taken as constants, we shall be enabled to approximate to the amount of statical heat in the conductor, and the degree in which the metal will be affected.

It is worthy of notice here, that contrary to what might have been expected on the water being withdrawn, th mometer, nearest to the recipien farthest from the heat, rose wi greatest rapidity, indicating a spe revulsion, or backing up of the hea proving that the increased heat of t was referable to the diminished po the recipient, and not to the sup heat. This is extremely instr proving the diminished power of c tion in the recipient air, compar with that of water.

TABLE I.

Time in minutes.	Therm. No. 1.	Therm. No. 2.	Therm. No. 3.	Tem of
0	54	54	54	
5	164	126	98	
10	244	183	136	
15	300	222	166	
20	340	254	189	
25	366	274	206	
30	382	288	218	
35	392	296	227	
40	398	304	234	
45	399	306	237	
50	400	309	242	b
55	400	310	242	
60	413	340	284	Th
65	438	374	320	bein
70	454	394	340	off,
75	464	402	350	reci
80	472	412	380	chan
85	476	415	362	air.
90	476	415	362	

By inspection of this table, No. find that between the periods, 55 minutes, (say in five minutes), th mometer No. 3, (the farthest fr heat), had risen 42°, that is, from to 284°; whereas, No. 1, (that to the heat), rose but 13° in the five minutes, say from 400° to 413° proving, that what may be calle wave of statical increase had flowed wards towards the source of heat, a manner strictly analogous to what take place if, instead of a stream o it had been a stream of water in a canal.

The bearing, practically, of this tration is, that the temperature of ductor plate or bar will be influenc so much by the quantity of heat im to the conductor, as by the absorb convecting power of the recipient. also shows the practical error of buting injury to what is going on the boiler, or in the plates them while we neglect what is taking within the boiler, where the real of injury exists.

able further shows, that, by rea-
ie restricted power which the air
s of carrying away the heat from
luctor bar, the temperature of the
ipidly increases, until a second
nent" state is established; and
e three thermometers stand, re-
ly, at 476°, 415°, 362°, the
: difference here is but 114°,
with water as the recipient it
°. This relation of 114° to 158°,
dicates the ratio of the conductive
of the bar brought into action by
ience of the respective recipients,
water. Again, we see that this
tical heat of the bar is in the ratio
onvecting power of the recipient,
'mometer nearest to the source of
ing from 46° to 476,° while that
moved rose from 242° to 362°.
ther instructive relations might
: noticed, if time and space per-

more accurately to observe the
relations between the statical
namical heat, under a different
f things, I reversed the experi-
nd began the operation with air as
pient; then changing it to water,
as the first permanent state of
ature was established, and which,
Table No. II., we see took place
-five minutes. The results here
ally interesting and instructive.

TABLE II.

Therm. No. 1.	Therm. No. 2.	Therm. No. 3.	
54	54	54	
170	132	100	
270	220	178	
350	288	237	
400	355	280	The recipient being air, & then changed to water.
434	367	311	
457	390	333	
471	406	349	
475	413	360	
476	414	362	Temperature of water.
476	414	362	54
432	315	230	127
388	298	*228	153
380	296	232	173
374	*296	236	186
*372	297	239	200
373	299	241	208
380	303	243	211
388	306	244	212
392	309	244	boiling

three thermometers, we see, con-
rising until they *arrived respect-*
*476°, 414°, 360°, when they re-*mained stationary, such being the indicated amount of statical heat. (It should here be observed, that these numbers cannot be taken as giving the *absolute* temperature of the bar, although they approach sufficiently near to give the *relative* temperatures, under the influence of the recipients, air and water. It will hereafter be shown how near they approach to such absolute temperature.) The recipient being now changed from air to water—the latter being poured into the vessel B—we see the superior convecting power of the latter at once brought into action, by the immediate lowering of the temperature of the bar. On the water being again raised to the boiling point, a permanent state is again established, as in the preceding example, whatever variance has taken place being accidental. It is here important to observe how the analogy between the current of conducted heat and a current of water is maintained; for we see that, although thermometer No. 3 arrives at its minimum, 228°, in 60 minutes, as marked with an *, No. 2 does not reach it until after 70 minutes, and No. 1 until 75 minutes. These experiments were made with great care, although the adjustment of the apparatus required much exactness, to produce uniform results. Throughout the whole we see sufficient to justify the observation, that much remains yet to be done, before this complicated subject be exhausted. The practical inference I draw from the above experiments is, that they afford sufficient proof of the position before stated, namely, that it is not to the furnace or draught, or activity of the fire, we are to look for that accumulation of heat in the plates of ordinary boilers which produces overheating and rupture, but to the recipient, and its powers of carrying away and absorbing the heat which the conductor plate or bar is capable of imparting.

Purposing to continue this subject on a future occasion,

I am yours, &c.,
C. W. Williams.

Liverpool, Feb. 21, 1842.

FURNACES AND BOILERS—MR. ARMSTRONG IN REPLY TO MR. C. W. WILLIAMS.

Sir,—I had written a reply to and refutation of Mr. C. W. Williams's funny review of my "diffuso-separative" theory, as he calls it, in No. 963 of your Magazine, before

I saw the second part of that review inserted in the succeeding Number for January 29th.

* * * *

Not, however, being blessed with that morbid thin-skinnedness, so characteristic of Mr. W.'s countrymen, as to feel very extremely alarmed at the first flash of his double-tubed pop-gun communication,* * * I was induced to lay by my reply * * * to be used at a more convenient season, "for reasons," as he has it, in his own "*recantation*" at page 111 of your last Magazine but one, "which will appear hereafter."

Although you declined to publish my last letter in reply to Mr. Dirck's attack on me last year, respecting this same "smoke-nuisance" controversy, I still confidently expect that your sense of justice and propriety will induce you to insert *unmutilated* the enclosed copy of my report on the failure of Mr. Williams's patent furnace at the works of Messrs. Hamnett and Co., of Manchester, and which report was first printed by me in July last, and since published in the *Mining Journal* and elsewhere.*

After perusing this report, I trust your readers will be able to appreciate in a proper manner Mr. Williams's repeated assertion that I made that report before I had seen "a single furnace erected by him," or by his "directions." Why, this very furnace was erected by his advertised agents Dircks and Co., Mr. Williams himself being present when it was tried, and a witness to its failure. An alteration was afterwards made by Mr. Williams's direction, and then it failed again by the giving way of the boiler: as it is demonstrable it always must do, whenever the engine is fully loaded, or a considerable supply of steam is wanted from the boiler, so as to require tolerably hard firing.

The above facts have been verified to the satisfaction of every one who has chosen to inquire of the proprietors of the boiler in question; and the same consequences have ensued, many of them fatal to human life, and must inevitably ensue again, wherever Mr. Williams's principle of letting in cold air at or beyond the bridge of the furnace has been carried out under the same circumstances.

Another of several of the patent furnaces examined by me was on the premises of those same agents, Dircks and Co., engineers, &c., Vulcan-street, Liverpool, which the public were repeatedly invited to inspect by public advertisement, and which I described and condemned in the *Liverpool Mercury* twelve months ago, as well as in your Magazine for March 6th of last year.

It is certainly true that Mr. W. threw the legal responsibility for the damage done to the boiler, in the first case above mentioned, on his agents. But, if Mr. Williams really thinks it necessary to endeavour to get rid of these facts on the ground of his not being responsible for his agents, then, indeed, his case is more hopeless than even I had supposed.

The desperate case in which Mr. Williams finds himself is still, however, more clearly evinced by this last strange exhibition of himself in your pages. In page 88 of the *Mechanics' Magazine*, he gravely states that *I wrote* to his agent a letter of "*recantation*," which he professes to quote from, beginning as follows:—"I find that the opinions expressed in my report before named were formed on erroneous data," &c. &c. Now, for a reckless audacious assertion, such as I have before had occasion to give to its author its only proper name, this deliberately written one beats all that I believe was ever before recorded in the annals of mendacity, and really deserves a patent for its originality;* for I not only never wrote a single line or a word of what he charges me with, nor authorised any one to do so for me, nor have I ever expressed a single syllable, either verbally or otherwise, to the effect stated by him; but I have never even had the least communication with either himself, his agents, or his solicitors, in any way, or on any subject whatever, since the letter, from which the extract referred to in the above-quoted passage appears to have been taken, was written; *that letter being written by himself*, or his agents, and sent to me by his solicitors, annexed to one from them-

* The *truth* of the report referred to is denied by Mr. Williams, and Mr. Armstrong afterwards admits that it is the subject of an action pending against him for libel We do not, under these circumstances, consider that we should be acting either with "justice," or "propriety," were we to comply with his request. When proved to be no libel, we shall be very ready to give it a place in our pages; but if it be one, it has had more than sufficient publicity already. We may here add, in explanation of the asterisks in the first paragraph of this letter, that they denote parts which we have left out, because we cannot allow our pages to be made, on any pretext, the medium of wanton insult to any one, far less to a scientific inquirer of so original, so philosophical, so practically useful, and withal so sincere [illegible] a stamp as Mr. Williams.—Ed. M. M.

* Mr. Armstrong is aware that Mr. Williams recalled the statement in question of his own accord, the moment he saw it in print—for this is what he previously alludes to, as Mr. Williams's "recantation at page 111:" and to speak of an acknowledged mistake in such terms as these is not right. We must, in justice to Mr. Williams, add, that he wrote to us to make the necessary correction in the statement, even before it appeared in print; but, in consequence of the Number in which it was published happening to be printed off a day earlier in the week than usual, his letter came to hand a day too late for the purpose.—Ed. M. M.

lated the 10th of December last, in-
me that they were instructed to
ce legal proceedings against me for
very of damages for injury sustained
irculation of my report before named,
hat annexed letter of recantation was
before the expiration of the next day.
ngly, in a very few days afterwards,
rved with what is called a "copy of
' desiring me to appear at a certain
Westminster, in an inconveniently
pace of time. This proceeding, I
really did alarm me a little at the
t, rather more than any thing Mr.
is is able to write in your Magazine.
ed the document to several of my
who were all as much astonished at
rself, knowing well that I had said
but what every one who knew me
l to be true; but they all advised me
t into the hands of a respectable so-
which I accordingly did, together
y "Copy of Report," and his so-
letter above mentioned, where I
they will all be dealt with according
What Mr. Williams's next move
I know not; but I think he is in a
to prove himself almost as clever at
proper business, "law," as he is at
urning.

I am, Sir, yours, &c.,

R. Armstrong.

s Arches, Manchester.
ebruary 19, 1842.

CTS OF SPECIFICATIONS OF ENGLISH
ATENTS RECENTLY ENROLLED.

THOMAS CARR, OF THE TOWN
UNTY OF NEWCASTLE-UPON-TYNE,
provements in steam engines. (A
nication.) Enrolment office, Feb.
2.

steam-engine constructed according
e improvements, has its piston-rod
through a stuffing-box, having the
r of a universal joint. This stuffing-
a spherical box, working in a ball
e top of a box which slides to and fro
etailed joints in the steam cylinder
The piston-rod is jointed to the pis-
attached directly to the crank of the
shaft; the universal jointed stuffing-
l the sliding-box, conforming to its
nt and vibrating backward and for-
the extent of its deviation from the
licular. The air-pump is placed im-
ly beneath the cylinder, and worked
bucket-rod, being attached to the
side of the steam-piston, passing
a stuffing-box in the base of the
ylinder.

The valves are worked by the sliding-box before mentioned in the following manner:—a stud or pin projects from the front side of the box and works in the lower limb of a T-shaped lever, centred in the middle of the horizontal portion. At each extremity of the upper arms is fixed a pin, from one of which a connecting-rod passes down to the valve-rod. As the box slides backward and forward upon the cylinder, a rocking or oscillating motion is given to the lever, and the raising or depressing of the valve-rod effected. In order to reverse the motion of the engine, the valve-rod is merely shifted from the one arm to the other, which brings about the desired end.

Another arrangement for reversing the motion of steam-engines, without altering the valves or gearing, consists in placing an intermediate slide or port-piece between the D valve and the cylinder-ports, by shifting of which, the induction and eduction passages become reversed.

For working the cold and hot water pumps, the following arrangement is adopted. On the opposite end of the main shaft to that at which the crank is situated, the first motion wheel is keyed, and on the outer face of this wheel, a pin is placed eccentrically to its axis; from this a connecting-rod passes down to a triangular-shaped block of metal, working between two upright guides; to this block, the piston of the cold water pump, and the plunger of the hot water pump, are attached,—the object of the weight being to counterbalance the piston, air-pump, bucket, &c.

In lieu of the ordinary governor, the patentee employs the following apparatus:—A pulley is driven by means of a belt on the driving-shaft, and upon the periphery of this pulley rests a smaller pulley, attached to a bell-crank lever in connexion with the throttle-valve of the engine. At the regulated speed of working, the two pulleys merely revolve in contact; but should that speed be exceeded, the small pulley is drawn forward by the increased velocity of the larger one, and the throttle-valve being acted upon, partially shuts off the steam.

The claim is, 1. To the method and arrangement for working the valves of steam-engines, by taking the motion directly from the moveable stuffing-box of the piston-rod, and conveying it to the valve-rod, and for the arrangement for reversing the motion of the engine; 2. To the method of reversing the motion of steam-engines, without altering the valves or gear; 3. To the method and arrangement for working the hot and cold water pumps, and for counterbalancing the weight of piston, air-pump bucket, &c.;

4. To the method and arrangement for regulating the motion of steam or other fluid engines by means of a frictional governor.

CHARLES DE BERGUE, OF BROAD-STREET, LONDON, MERCHANT, *for improvements in axletrees and axletree boxes.* (A communication.) Enrolment Office, February 21, 1842.

The axletree has two shoulders of increased diameters near its inner extremity, between which a divided nut of iron, steel, brass, or other suitable metal, is placed. On the outside of this nut a male threaded screw is cut, and a corresponding female-threaded screw is cut in the end of the axletree box to receive it.

On putting this divided nut between the two projections on the axletree, and then screwing it into the axletree box, they become firmly and securely united together, and the wheel cannot come off until the nut is unscrewed. In order to prevent the screw working loose, it is screwed up the reverse way to the wheel's progressive motion. A small cap or chamber is screwed into the front of the axletree box, to contain a supply of oil for lubricating the axle; there is also a recess cut about the middle of the axle, and another in the box or bush around the inner shoulder, while an accurately-turned groove in the hinder shoulder is filled with sponge, or other suitable packing, to prevent the escape of the oil.

The claim is to the divided nut and the screwed part of the axletree box, as applied to axletrees and axletree boxes.

GEORGE HICKES, OF MANCHESTER, AGENT, *for an improved machine for cleaning or freeing wool, and other fibrous materials, of burs and other extraneous substances.* Enrolment Office, February 21, 1842.

This machine consists of four equidistant horizontal shafts, running parallel to each other on a frame of wood or iron. In front of each shaft is a set of drawing-rollers, which deliver the wool to the beaters. Under each set of beaters is an open grate, so curved as to form part of the circle described by the extremities of the beaters as they revolve. A narrow plate is placed in a vertical position, immediately below the delivering-roller of each set, and on it the wool is beaten, as it is delivered; the burs falling through the grate as they are struck out from the wool. Each set of drawing-rollers is provided with a feeding-cloth, and when the machine is put into operation, the upper sides of the feeding-cloths move in the direction of the drawing-rollers; the beaters on the first two shafts revolve at one speed, while those on the last two shafts revolve rather faster. The drawing-rollers likewise corre[...] their respective speeds. Suppos[...] to be opened and spread on the [...] cloth in front, it is received by [...] set of drawing-rollers, when it is [...] drawn, and delivered to the actio[...] first beater, which partly frees it fr[...] and other extraneous substances, d[...] the wool over the grate, on to th[...] feeding-cloth; from this cloth it [...] forwards to the succeeding rollers, [...] is drawn, beaten, and finally delive[...] finished state into a hopper, or other receptacle.

The space between each blade [...] beater is filled up by sheet-iron, wir[...] or other suitable material, to pre[...] wool from adhering to the beater[...] must be sufficiently far apart to pre[...] staple of the wool reaching from on[...] other during the operation.

The under roller of each set is [...] with a doctor, having an alternat[...] motion given it; and the doctor [...] against the second of the set by [...] hung on a tail-piece, so that it has [...] stant tendency to press the doctor [...] the under part of the roller, and free[...] any dirt or extraneous matter whic[...] cause the wool to lap, and impede th[...] of the machine. The doctor, with th[...] ratus which supports it, is traverse[...] wards and forwards by a crank, or ec[...] at the end of the driving rollers.

In another arrangement for delive[...] wool from one beater to another, the [...] cloth is put in an inclined position, [...] near the drawing-rollers being the [...] Immediately over the cloth is placed [...] ing grate, the end of which is tri[...] The wool is received against the upri[...] of this grate when delivered from th[...] behind; the burs pass through the [...] side, and fall on a tray inside the [...] while the wool is drawn down by the [...] of the moving grate, and is carried [...] between it and the feeding-cloth ben[...] the succeeding drawing-rollers.

The claim is, 1. To the general co[...] tion and arrangement of an improv[...] chine, as regards the beaters being [...] combination with a curved rack an[...] ing-roller; 2. To the particular const[...] of the beaters, and the application o[...] tor, used in combination with a curv[...] and drawing-rollers; 3. To the pl[...] which the wool is dressed, or subje[...] the action of the beaters; 4. To th[...] moving grate, with its rollers and [...] which the wool is thrown on leavi[...] beaters, as described and applied as a[...]

NOTES AND NOTICES.

...cy of Electro-Magnetism as a M...ving ...Mr. J. P. Joule, in a paper on this subject, ...d at the Manchester Royal Victoria Gal... ...ed the following to be the greatest result he ... able to obtain, with a powerful apparatus. ...und of zinc produced a mechanical force ...ised 331,400 lbs. to the height of one foot, ...e revolving magnets moved eight feet per ... The duty of the best Cornish steam-engine ...00 lbs., or nearly five times the extreme ...was able to obtain by the consumption of ...d of zinc. This was so very unfavourable ... that he almost despaired of electro-mag... ...eing applicable to mechanical purposes in ...e of steam. He did not see how any ar... ...t of the apparatus could make the duty of ...f zinc much superior to the duty of a pound ...and, even if it could be attained the ex... zinc was so great, compared with the price ...s to prevent such apparatus being ever used ...out peculiar purposes. Professor Phillips ...d, in the course of a discussion which fol... ...reading of Mr. Joule's paper, that he had ...y plan, American and German, locomotive ...onary, and never yet found one apparatus ...d not be stopped with the finger. The most ...an he had seen was one where there were ...-shoe magnets; the two poles were always ...t, and the centre of motion was the line ... the two poles. Though it had a lifting ...200, he found it difficult to get a sufficient ...stroke; he was obliged to get it by a lever ...rd kind, which reduced the power so much, ...ould not get the lever to work. He tried ...weight of 3 lbs., and it worked very well ... wheels were lifted up, but it would not ...lf, it would not start. The distinction was ...d between pulling and supporting. A mag... ...l support an enormous weight in contact, ... distance of a quarter of an inch, it would ...aps, pull 2 lbs. A magnet that would sup... ...t, would, perhaps, pull only a quarter of a ...uarter of an inch.

...s Ericsson's Propeller. — The *Kingston Chronicle* mentions a very successful ap... ...of this propeller to a steam-vessel called ...dalia," which plies between Kingston and ... The vessel is described as of 140 tons ...90 feet long, and 2... feet 2 inches wide; ... when light, 2 feet 6 inches, and when ...out 6 feet. The boiler is on the locomo... ... with about 100 pipes running through it. ...ne consists of two cylinders of about 12 ...ameter, and the motion is communicated ...o the crank or the shaft of the propellers, ... 4 feet 6 inches in diameter, and placed ...ach side of the rudder, working towards ...r, in the manner of sculling. The engine ...m 60 to 75 strokes a minute, and is worked ... with steam at about 55 lbs. pressure. The ...lized, under favourable circumstances, is ... 10 miles per hour. "She has been to ...," the account adds, "and up the Welland ...th cargoes; no perceptible motion occurs ...nks of the canal, more than occurs by ves... ...towed up in the usual manner. She has ...ed two or three heavy gales, and behaved ...ly well; she steers admirably."

...iety of Arts and Patent Inventions.—In ... of a Report from a Select Committee of ...ty, appointed to consider the best means ...ing its usefulness, (*i. e.* of redeeming it ...tate of comparative *uselessness* into which ... late fallen,) notices of *patent* inventions, ... excluded from the class of subjects which ...y honoured with its attention, are to be re... ...d read at the weekly meetings. "The ... each paper," it is stated, "will be followed ...*ssion*, for the purpose of eliciting from the ...e of those who are *practically engaged* in the arts and manufactures such information as may give the subject a sufficient degree of completeness to make it *serve as a guide for the public as to the real value of the invention.*" We anticipate but little good from this scheme; none whatever for the public, and not much for the Society. The "notices" will be puffs, and the "discussions" upon them either fulsome testimonials bespoke for the occasion, or unmannerly brawls between rival pretenders and their partisans

Gifts to Mechanics' Institutions.—The public-spirited and philanthropic Mr. Joseph Strutt has presented to the Derby Mechanics' Institution, of which he is President, 22 excellent paintings, by eminent ancient and modern masters, including a fine piece by Poussin, and some of the best productions of West and Fuseli, accompanied by a letter, in which he expresses a hope, (in which we cordially join,) that "they may prove to others a stimulus to increase the collection, and thereby encourage those among the students who are improving themselves in the arts of drawing and painting." The *Aberdeen Herald* records a similar instance of munificent liberality on the part of a Scotch nobleman. "Lord Panmure has formally made over to the new Mechanics' Institution, Brechin, the handsome apartments which he erected for its use, together with the fine collection of paintings which decorate the hall. His Lordship at the same time handed to the President and Vice-President a check for 1,000*l.*, to be vested in trustees for behoof of the institution. Thus, by the enlightened liberality of this nobleman, the youth of Brechin have been provided with elegant schools, and the mechanics with a splendid hall, and the means of obtaining instruction in useful knowledge and rational amusement in all time coming."

Coal in India.—Colonel Sykes, at a late meeting of the Asiatic Society, mentioned, as an instance of the long prevailing ignorance, in this country, of the resources of India, that though a few years ago coal was supposed to be utterly unknown throughout that vast region, there are no less than fifty-seven localities in which it has been now ascertained to exist.

The Artesian Well at Grenelle.—A new tube is now making for the well of Grenelle in iron, of such a thickness that it will bear the pressure of 50 to 60 atmospheres. Experiments have been tried on two tubes placed one within the other, as the tubes were in the bore of the well, to ascertain what degrees of pressure would be necessary to force them in; but though the hydraulic ram was employed, it required a pressure of from 12 to 15 atmospheres to produce any effect on the tubes. The water still flows as copiously as ever, moderately warm, and alternately limpid and black as the sewers of Paris. —*Galignani's Messenger.*

Swiss Watch Manufacture.—There is no branch of Swiss industry so prosperous as its watch manufacture. Four years ago 70,000 watches were annually made. At least 100,000 are now produced. A great deal of the work is done in the mountains, and nearly all the rough work is done there by women, the finer work by men. The wages are very low, considering the nature of the work; but the fact is, that there is no scarcity of that skill and sobriety, and steadiness of hand and eye, essential to this class of work. It is in-door work, too, and suits them during the long continuance of weather too inclement in the mountains to permit of open air occupation. It is surprising how few are the tools, and how delicate the use of them by the artisan peasantry, who carry on this manufacture in Switzerland. Carouges and Geneva are the great marts of the trade, and thence work is given out to the surrounding villagers, and they must work hard to earn two francs a day; the majority do not average more than 30 sols. (15*d.*)—The superiority of the watch manufacture is a signal evidence of the skill and merit of the people. The perfection

[illegible]

[illegible] like the same way as the [illegible] the gramme, [illegible] would signify [illegible] part of the same [illegible].

[illegible].—A correspondent of the [illegible] asks, "How the floors of lower [illegible] may be cured of humidity?" By a [illegible] of tar laid on and covered with fine [illegible] and then beaten as floors are wont to be. The [illegible] is cheap and infallible. A suite of rooms, to our knowledge, which were so damp that the mats rotted in a month, were thus laid with tar, and there has not been the slightest symptom of dampness for the last six years. A set of mats now lasts two and three years, and the white ants have disappeared.

Naval Architecture.—We have seen a model of a vessel, of a curious and novel construction, to which we would direct the attention of nautical readers. The object is—swift sailing with facility of manœuvring, in order to accomplish which, the keel is made very deep at a point in the centre, and slopes upwards towards the bow and stern in the form of an obtuse angle. The inventor supposes that a vessel with a keel so constructed, would sail very close to the wind, while it would obey the helm much more quickly than an ordinary vessel, as it would turn in the water as it were upon a pivot. There is also a peculiarity in the rigging, the masts, three in number, radiating from the centre, the mainmast being upright—the foremast sloping forward, and the mizen having a similar rake backward. This arrangement is to suit the form of the sails, which are, with the exception of some of those on the mainmast, triangular, with a view to have the principal pressure on the canvass as low as possible for the sake of safety, and also to facilitate tacking. It is impossible to explain the plan [illegible] without diagrams, and we question [illegible] even nautical men could venture a [illegible] on its merits [illegible] experiment [illegible]. Meanwhile [illegible]

[illegible]

[illegible] the superior qualities of the [illegible] a quantity of sulpho-cyanic [illegible] which inevitably destroyed an[illegible] life. A member had observed [illegible] that [illegible] prepared by kyanizing had [illegible] in the same situations, where tim[illegible] been saturated with coal oil, had res[illegible] attacks of the Teredo. The statement [illegible] confirmed by a member, who st[illegible] the Mediterranean, where the ravages [illegible] were most extensive, the vessels being [illegible] were entirely protected by prepared [illegible]. The coal tar must, however, be deprive[d of] the ammonia, as that substance produced in[illegible] decay in timber: ammonia might be a[illegible] used for manure in peaty soil, as i[t de]stroyed the vegetable fibre with great rapidity, [and] produced rich soil.

Earthquake in Cornwall.—A severe shock of earthquake was experienced on Thursday morn[ing] the 17th ult. at about half-past eight, through the great mining districts of Cornwall, ext[end]ing from the sea shore to the south of Helston almost the opposite coast, north of Redruth. [The] shock was distinctly felt at Flushing, Falmo[uth], Penryn, Gwennap and Redruth, but did not re[ach] so far eastward as Truro. The miners at work [in] the lower levels at Trewavas, which are under [the] sea, in the parish of Breage, hurried to the sh[aft], supposing that an irruption of the sea had ta[ken] place into the mine, as they heard a confused [noise] which accompanied the shock. This phenomenon is exceedingly rare in Cornwall.

Electro-Lace.—At the London Electrical Soci[ety] (Feb. 15,) the Secretary read a description of "e[lec]tro-lace," a novel, but pretty application of the e[lec]trotype. The basis is net, prepared according [to] the usual plans. A few hours' action so cove[rs it] with copper, that it seems converted into that m[etal]. Specimens were exhibited, which were much [ad]mired. It opens a new and wide field for [the] extension of this art to the production of the [de]licate and chaste ornaments, and fancy articles constructed of perforated cards, &c. The l[ace is] readily plated: nor is the application conf[ined to] this article alone, but may be extended to [the] various gauzes and delicate fabrics with wh[ich the] market abounds.

The *Little Western* is certainly a favoura[ble ex]ample of the skill of Bristol mechanicians, [but if] there is any thing either in the structure of [her] or machinery pre-eminently excellent, we deny. In the production of the vessel there [seems] to have been too great a straining after [novelty], and there are evidences of a disposition [to] arrangements, not so much by the consider[ation of] what is excellent, as of what is unusual. [Fol]lowing are some of the proportions of the ve[ssel and] engines: she is 721 tons: measures betw[een per]pendiculars, 2[illegible] ft.; over all, 216 ft.; keel, [illegible]; breadth of beam, 27 ft., and, including padd[le boxes], 4[illegible] ft.; length of saloon, 44 ft., by 21 ft. wide; cabin, [illegible] ft. long.—*The Civil Engineer and [Architect's Journal].*

☞ *Intending Patentees may be [supplied] gratis with Instructions, by applica[tion] [illegible] to Messrs. J. C. Robertson* [illegible] *Fleet-street, by whom is* [illegible] COMPLETE REGISTRY OF PATE[NTS] from 1617 to the [illegible] British and [illegible] prepared [illegible]

[illegible]

Mechanics' Magazine,

SEUM, REGISTER, JOURNAL, AND GAZETTE.

970.] SATURDAY, MARCH 12, 1842. [Price 3d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet street.

ON THE CONSTRUCTION OF CAST-IRON AND CONCRETE BREAKWATERS FOR THE FORMATION OF HARBOURS, PIERS, JETTIES, WHARFS, DOCKS, EMBANKMENTS, GROYNES, ETC. BY MR. GEORGE ADOLPHUS WIGNEY, BREWER, BRIGHTON.

Sir,—Having conferred on me the favour to insert the principal portion (No. 963, page 70, of the present volume of your valuable work) of my Address to "My fellow Townsmen," relative to the formation of a harbour of refuge, and for pleasurable purposes, for the town of Brighton, constructed of solid breakwaters, composed of cast-iron plates filled with concrete, I now send you a perspective sketch of the same, and of the lighthouse, the two adjoining towers, and intermediate caissons, which I suggested should be first constructed and put down as an experimental test of the principle, and with a view to the obtainment of requisite experience, preparatory to the execution of the whole.

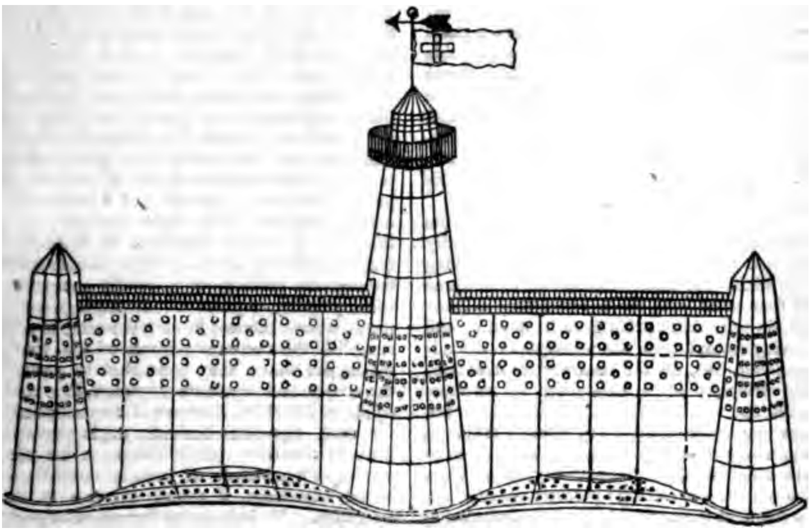
Having furnished explanatory details relative to the work as a structure, in the Address referred to, and which, with the accompanying sketches will furnish sufficient information to your readers of the materials, and the mode and principle of its construction, a few additional particulars omitted in that Address, and furnished in the same consecutive order, will alone be requisite to convey to their minds, all that appears to me to be needed on the subject.

I. *The Breakwater considered as a Structure.*—A perspective design of the harbour, and a model of the lighthouse, the two adjacent towers and the intermediate caissons, have for the last six weeks been exhibited at the Town Hall of this place, and the only objection, which has yet met my ears to it as a structure is, the anticipated destruction of the cast-iron plates by oxidation. To obviate such apprehension, I beg to state, that the coating of them with gas tar, I propose should be accomplished in a way suggested to me by Mr. Rutter, Manager of the Original Brighton Gas Company's Works, by causing each plate, when cast, and cooled down to a suitable, yet elevated temperature, to be plunged into a tank of gas tar, when, being in an expanded state, the tar will, in a slight measure penetrate its pores, and by subsequent contraction retain it within them. Concurring with Mr. Rutter, in opinion, that by such a procedure, they will also acquire a highly glazed and concentrated coat, well calculated to resist the action of salt water, I avail myself of this opportunity to acknowledge and state his suggestion, and at the same time to express a request to any of your numerous correspondents, not only to oblige me through the medium of your pages with any useful suggestions they may be able to furnish, but also to point out any defects which they may perceive in the principle or materials of the proposed structure. I trust that my deviation from my profession as a brewer to take up temporarily the profession of an amateur engineer, will not induce any gentleman of that profession to withhold any useful information, the more particularly as to their contributions to your pages, I stand principally indebted for that little portion of knowledge which I possess in this department of the sciences. Should the gas-tar thus applied be deemed, or found insufficient to furnish the required protection, it becomes a question of efficacy and cost, whether zinc might not be advantageously employed to protect those plates which may be constantly and occasionally immersed in water. But, independent of either resource, I presume that their durability would be very considerable, and much more so than wood, which is so subject to the ravages of sea lice, of which the piles of our chain pier already furnish a demonstrative proof.

The whole of the flanges I propose to turn inwards, with a view to protect the bolts from oxidation. The concrete may be composed of lime, sand, and gravel, and concentrated gas-tar and gravel, the latter material to be placed in contact with the plates within in the form of blocks, and the centre to be filled with the former. I feel pleasure in being able also to record for publicity, that which appears to me to be a most valuable suggestion for the improvement of the principle of construction of my breakwaters, as furnished me by Mr. Matthews, who has for about the last 20 years acted as the managing master of the chain pier, and whose judgment and experience in such subjects, I think no one will doubt. To diminish the force of the waves, Mr. M. suggests, that both towers and caissons should be perforated with a series of cast-iron tubes passing through the concrete and the sides, open at both ends, flanged at the extremities, and thereby connecting more firmly together the opposite sides; placed of course at a suitable angle from a horizontal position, dipping toward the exterior, (or as it may be termed, the storm side of each breakwater,) in order that a portion of the water composing each wave, may pass through each tube, and thereby break and divide its impulsive force. Being posited at such an angle, such portion of the water of each wave, as

is not forced through to the inner basin, for want of a sufficient impelling force, would return again to meet, and in a measure break the force of each succeeding wave.

II. *As a fortified Harbour and an armed line of defence for the Town in time of War.*—The paramount duty of a paternal government, appears to me to be, to provide for war in the time of peace, not only with a view to prepare for inevitable defence, but also to repress any agressive disposition which may be entertained by latent enemies, by our exhibition of real defensive and offensive power, ever ready to be brought into prompt and energetic action. The measures which our executive have adopted for offensive operations, both as relates to the navy and army, recent events have proved to be adequate to present wants, and offer the satisfactory promise of capabilities equal to any future need. But such cannot be said of our defensive resources; for where between Dover and Portsmouth (without travelling further) is there a single port fit for the entrance or exit of a defensive fleet? Or where is there a battery fit to repel a single ship of war? Having heard of and seen, and somewhat felt, the general consternation and dread that prevailed along the southern coast, in early life, when those formidable and extensive preparations were made on the part of France for the invasion of England—when mercenary troops were hired and encamped along our shores—when Sussex guides were appointed to lead the aged and the young, together with the weaker sex, into the interior,—when the land defences, the Martello Towers, few and far between, were erected—and which invasion, with all its attendant horrors, only appeared to be pre-



vented, by the diversion of those immense forces which were collected at Boulogne for the purpose, caused by the threatening and aggressive attitude of the great Northern Powers—I cannot but put the question to others and myself, why may not danger of an equal, or far more serious character, arise? What may be the promptings to aggression, and what the increase of power to inflict misery and devastation on our shores, it is impossible to foretell; considering especially the facilities which steam vessels of war, and improved projectile implements of warfare, in existence and in embryo, afford to powerful and ambitious neighbours to carry schemes of devastation, (if not of conquest,) into sudden execution, while circumstances may have placed our floating bulwarks at too great a distance, or beyond the reach of rescue, to arrive in time to avert the impending evils that may be poured upon us at every turn and opportunity. Where are the improvements of defence which have been, or rather might have been, effected along our unsheltered coast? At the time I allude to, Brighton, though in its infancy, was crowned with three batteries,—a western, eastern, and a central; but since then, it has risen to a high state of opulence, and grandeur, and those defences are diminished from three to one, and that one, as compared with the marine frontage, and extent of the town, may fairly be termed but a state toy, merely kept up for the purpose of firing royal

salutes, on birthdays and arrivals. Can the inhabitants of Brighton, who possess so large an amount of property in so indefensible a condition, many of whom have risen by its rising, have prospered on its greatness, and the whole of whom have so great a stake in the continuance of its prosperity—or can the government, who derive so large a revenue, both by direct and indirect taxation, from its various resources—remain much longer indifferent to so hazardous a state of things? By the plan to which I solicit attention, a fixed and permanent defensive protection from towers and ramparts would be establishd of any extent that may be deemed desirable, and the southern line of which, extending, as it may, from three to four thousand feet distance from the shore, would be found sufficient to prevent either shot or shell reaching the town from any invading fleet, while within the line of fortifications a naval force of any requisite magnitude might ride at anchor, able at all times of tide to leave the haven and chase the foe? And these accompanied by all the other advantages which have been, and yet remain to be enumerated, are obtainable at a cost but little, if any, exceeding that of a single steam frigate.

III. *As a Mercantile Harbour.*—In the Address referred to, I stated that we happily do not at present need one, already having one within the short distance of from three to four miles, and by a connecting railway within ten minutes ride from its mouth; and having set out upon the principle of not advocating, but, on the contrary, repudiating, the principle of endeavouring to interfere with the vested rights of others, I am not now going to change my course, although upon subsequent reflection I have come to the conclusion, that we partially need a mercantile harbour, though perhaps not one that is free and unrestricted for the admission of vessels of every class of merchandise. For, in the first instance, I think we need a mercantile harbour, restricted to the admission of vessels of such a burthen as cannot, or will not, enter the port of Shoreham, and which are freighted with what may be termed clean cargoes, not only for the sake of bringing to our town, by direct communication, many of those articles of merchandise that are continually passing by, and ultimately received by us, by a very long and circuitous route, at prices much enhanced by the superfluous extra cost of freight, of distant port expenses, and inland carriage; but also with a view to derive a portion, from such a source, of that income which is requisite to cover the annual disbursements, and furnish a remunerative interest to the shareholders. Hopeless as such a source of income may at first sight appear to many who are not well acquainted with the sinews and energetic grasp of commerce, it may be sufficient to refer them to the blank value of the one hundred pound shares in Shoreham harbour, about twenty years since, when I saw five of those shares treated as mere waste paper, which are now worth 250*l.* each, and on which the present annual dividends are 11 per cent. I know not why the future prospects of a "Brighton Harbour Company" might not brighten up to such a splendid polish. And what could the shareholders of the matron harbour lose by yielding to its more comely daughter, in addition to the gay trappings of pleasure, which it would be her first and paramount object to wear, a few of those substantial sources of revenue which she has not the capacity to receive and enjoy? Are there none, nay, are there not many of the Shoreham Harbour shareholders who are large owners of property, both in Brighton and its immediate vicinity, and who are deeply interested in the welfare of the latter place, and who, were they by such an arrangement to sustain loss from the right-hand pocket, but which (did your space permit) I have an abundance of matter to prove is impossible, would but find the deficiency restored, with ample interest, into the left. To obtain a harbour at Brighton, there apparently seems no other chance than through the medium of a public company, with, possibly, a grant of aid from government, whose interest in endeavouring to accomplish the recommendation of the commissioners whom they appointed to survey the coasts, and report their opinion, at a cost of about 200,000*l.*, instead of two millions, for each capacious harbour, might prompt them to contribute their assistance for the testing of a principle of such important national advantage, if found effective in its operation. To induce the formation of such a company, there must be a rational ground of expectation for the realization of an adequate income; and for the obtainment of such an income, the harbour must be made at least partially mercantile. To make out an estimate of the probable disbursements and receipts I freely acknowledge myself incapable, and the task is probably such an one as but few, if any, are capable of accomplishing: I will therefore content myself with pointing to a few of the sources from which I conceive a mercantile income may be derived from vessels of greater burthen than can or will enter the port of Shoreham. 1. Occasionally from East and West India vessels, which, meeting with adverse weather in the Channel, would prefer entering the port of Brighton, landing their goods, trans-

em to London by railway, and re- return their outward-bound car- er than risk the dangers of the assage to and from the Thames, be the loss of time, and incur the avigation charges incidental to the ge. 2. At all times, too, I think ht be a reasonable expectation of g and embarking a great portion ntal and other passengers, instead of effected at Spithead, as heretofore. , brandies, fruit, and grain, from f France, both for local consumption mission to London. 4. The fruits of Spain and Portugal, the Mediter- d Turkish fruits, and various de- of southern and western produce, st daily pass by our town, might same motives be prompted to yield e their cargoes in the new-found, commodious port. With inducive charges for entry, these different of commerce might furnish a large n conjunction with such as is to be om other sources, such as post- passenger packets to various quar- hts, pleasure-boats and fishing- ., all which would also contribute a to make up the requisite amount. r powerful motive which, it appears ould influence all the inhabitants ssors of property in Brighton to to obtain a partially mercantile or the admission of vessels of the rred to is, the additional support transit of their cargoes and pas- o and from London would afford ilway Company, in the welfare of mpany I conceive the majority of ons are deeply interested, for in the n to which the prosperity of that is raised will be the enhancement lue of the town property, and the nprovement of trade. In conformity e views, and to facilitate the con- of such cargoes, not only to and terminus of the railway, but also nveyance of such cargoes or por- uch as may be landed for local con- , and to obviate the chief objection habitants to a Brighton mercantile -the conveyance of the cargoes of vessels across and along the Ma- e, I will proceed to the discussion ext subject connected with these

he Situation and Extent of the pro- rbour.—In the perspective design bited at the Town-hall for public n, and of which the prefixed draw- reduced copy, I have shown the *er as situated in the centre of the harbour, and the length of the* southern breakwater as 3,000 feet. As I have not had time to measure off 1,500 feet to the westward of the pier, I am not prepared to say in what relative situation the western breakwater would stand to any particular part of the front of the town, in an opposite line, agreeable to the design. But, as the proposed extent of such harbour was but suppositive as to what might be requisite, and had no reference to its partial mercantile appropriation, I have concluded, upon reflection, that, the better to subserve the latter purpose, it would be best to place the western breakwater immediately opposite to, and in a line with, West-street, and to appropriate its causeway exclusively for the landing and embarkation of goods, a double set of iron rails being laid down for their transit. I next propose that a tunnel should be formed beneath the centre of West-street, and, crossing the King's-road, that its mouth should open on the causeway of such breakwater. In continuance from West-street I propose that it should pass across and beneath North-street, and continue its progress beneath the centre of the new street about to be built by Mr. Thomas Cooper, builder, of this place, and its northern mouth open in that part of the Railway Company's grounds which to them may appear the most suitable. For the conveyance of goods from the harbour to the several parts of the town, intended for local consumption, and also for the conveyance of goods arriving from London by railway for a similar purpose, I propose that radiating tunnels from such main tunnel should be formed, for the delivery of such goods, in the most convenient and suitable situations which might be found for general distribution; by which arrangement a great portion of the inconveniences resulting from the conveyance of goods through and across some localities wherein its transit is highly objectionable might be avoided. Taking the western breakwater as the point to measure from, the eastern may be placed as far to the eastward, beyond the Chain Pier, as may be deemed desirable, either as relates to the requisite magnitude of the harbour, or the cost to which it might be deemed desirable to go; and as relates to the southward, there being a considerable breadth of level surface to the southward of the position which I have selected for the southern breakwater, a much greater space in that direction may be gained, without an increase in the depth of water, if considered necessary.

V. *Estimated Expense.*—Since writing the Address to "my fellow Townsmen," I have made as careful, and as correct an estimate, as the data furnished me, and the absence of many requisite data for the accomplishment of such an unprecedented work will

enable me to do, and after having made a liberal, and, I conceive, an ample allowance for contingencies, I find the amount for the execution of the work to the extent of the design furnished, will be about 150,000*l*. The dimensions of the work I assume to be as follows:—about 3,200 feet from the esplanade of the chain-pier, to the lighthouse, in the centre of the southern breakwater, the length of which is about 3,000 feet, and the width of the harbour from east to west at the shore end, is about 3,400 feet, furnishing an average area of about 10,240,000 square feet. On a subsequent calculation of what would be the cost by continuing the eastern and western breakwaters of the same length, and by lengthening the southern breakwater to the extent of a mile, and thereby furnishing an area of about 16,896,000 square feet, I find the amount about 200,000*l*.

VI. *The need in which Brighton stands of a harbour, to enable her to maintain her supremacy as the queen of watering places.*—The town of Brighton has hitherto indisputably maintained and well deserved the enviable title which has been universally conferred upon her. Containing the marine pavilion of royalty—situated at the shortest distance of any sea-girt town from the capital of the empire—enjoying the advantage of a railway, which shortens the time of transit between each place to an average of about two hours—possessing a broad and well-conditioned marine drive of about a league in length—provided with wide and well-kept esplanades, the eastern commanding a lofty view of the broad expanse of waters to the south, and the western more lowly, yet more congenial to the taste of many, fringed with a green sloping bank of turf, that intervenes between its finely gravelled walk, and the blue ocean that nearly laves the grassy swath—gifted with a chain pier, that furnishes an agreeable promenade, and in fine weather, a most convenient platform for embarkation and debarkation, on and from the several packets that now do, and in future may, call to receive and discharge their freights;—graced with numerous mansions fit for the residence of princes;—with scarcely a street which is not well paved, well lighted, and well drained;—and, in fine, adorned with pleasing and varied natural and architectural beauties; replete with every comfort and convenience; remarkably cleanly and healthy; enjoying a pure atmosphere, bracing breezes, excellent bathing facilities, and every agreeable incentive to wholesome exercise and rational recreation. But with all these and many other unenumerated advantages, we are sadly deficient in marine scenery, and the means of gratifying a very large portion of our visitors, who are naturally partial to the scenes of naval and mercantile activity. Often from the eastern to the western horizon, not a single ship appears to grace and enliven the weary waste of waters, and when they pass, it is at such a distance, that they seem as if dreading approach to the dangerous shore. We are besides exceedingly deficient in natural and artificial security in time of war; and very inadequately supplied with all those resources for an extensive intercourse with the Continent and other places, which some of our rivals so eminently enjoy, among which, the most prominent is Southampton.

Much inferior as Southampton is to Brighton in the number, magnitude, and splendour of its buildings, and those internal arrangements and attractions, which have hitherto rendered Brighton so far superior to it as a fashionable, comfortable, and pleasant watering-place; yet it is situated in a warm, soft, and luxurious climate; environed on three sides with a most luxuriant country, and graced in front, with a deep, capacious, and most convenient harbour, bearing on its glassy bosom, a multitude of the magnificent emblems of our naval and commercial resources. Recently too she has opened wide her portals, both northern and southern, for the admission of all the blessings which commerce can bestow: a railway on the one hand, leading direct to docks on the other, connecting this comely branch by a three hours' railway communication, with the vast trunk of this powerful empire. Commerce is conducive to population and to wealth, and population and wealth to luxury; and luxury to every conceivable improvement; and with these natural and adventitious advantages, who can say that she is not in a fair way to carry off the palm of victory, and wrest from us, that proud and distinguished appellation which our town has hitherto so long and deservedly enjoyed, provided we rest satisfied with our present attainments, rely supinely confident on our acquisitions, and move not onward as competitors and leaders in that general and extensive race of improvement, which has so eminently marked the present age, as superior to its by-gone predecessors? And what other cause for jealousy do we possess? I well remember when I was young, our intercourse with France was maintained by three or four sailing packets, and generally well freighted, running between Brighton and Dieppe all the year through, (wind and weather permitting,) but since the introduction of steam-packets, this source of influx of visitors, has diminished to one solitary half-freighted steam-vessel, and that only running about five of the spring and summer months. Even this limited intercourse promises shortly

to become extinct from ten principal causes: The diminished time—distance from London to Southampton,—the very convenient port which Southampton possesses to embark and sail from,—its convenient, commodious, and economical harbour, to prompt Steam Navigation Companies, to cause their vessels to resort to it;—the beauties of the place and its vicinity, to prompt Foreign and British travellers to pass through it,—its contiguity to the garden of England—the Isle of Wight;—its proximity to Portsmouth, our chief naval depôt;—the passage of its packets through the assemblage of naval shipping at Spithead,—the superiority of the town and port of Havre to that of Dieppe;—the delightful river navigation of the Seine from Havre to Paris; and finally the contemplated railway, which is to connect Havre with the capital of the French empire, to which so many of the English annually resort. What need we, to add to our natural advantages, to enable us not only to participate in the benefits resulting from such intercourse, but to enjoy the superiority? I know of nothing but a safe, convenient, and commodious harbour; for, possessing as we do the great advantage over Southampton of being 27 miles nearer the metropolis by railway traffic, and 29 miles nearer Havre, we have but to add this great desideratum to our varied and extensive acquisitions, and then we shall make another rapid and permanent stride in the maintenance of our supremacy. Much am I mistaken in the character, disposition, spirit and enterprise of the inhabitants of Brighton, if they do not simultaneously come forward and declare, that nothing but a defensive, safe, convenient, commodious and ornamental harbour, will suit their purpose, or that they will ever sit down passively content without it.

VII. *The Suitability of the Material, and the proposed Principle of Construction, for general adoption in the formation of Harbours, Piers, Jetties, Wharfs, Docks, Embankments, Groynes, &c., throughout the Kingdom.*—We now have iron ships, and why not iron harbours? Wrought iron, of which such vessels are formed, is liable to be destroyed by oxidation as well as cast iron; and if men can trust their capital, their persons, and their merchandise in vessels formed of that material, why should they for one moment hesitate to embark their capital in that which, if protected by suitable means, is not more subject to destruction than the other in salt water, and much less so in air? And what material is there to be found that is not subject to decay; and what can be found less subject than the combined materials which I have selected for the purpose, with the adoption of that suitable protection? It is said, that the iron railing round St. Paul's is constructed of Sussex manufactured iron; but where is the man living, that can remember its manufacture or erection, so as to be able from personal knowledge to record its durability? True it undoubtedly is, that this railing having been so many years exposed only to atmospheric air, and distilled water in the form of rain or snow, the action of such elements must be widely different from the action on cast-iron immersed in salt water; but where is the wood to be found that would have lasted thus long, exposed to the same elements in the same situation as that railing? And by parity of reasoning, where is the wood to be found for piling and bracing that is equally, or a fifth part so durable as cast-iron under water, protected or unprotected? But I propose protection from the action of such water, as well as the aids of science (which I now invoke) will enable, and without which, if the judgment of an extensively experienced and well-informed person is to be relied on, (of which I have no reason to doubt,) such plates would last half a century, and a proportionably longer period with protection, in the ratio of the efficacy of the method adopted. And where are the wood piles, even when studded with wrought-iron nails, and coated with gas-tar, to preserve them from the destructive ravages of sea lice, (which improvement is now adopted for all the new piles, which are occasionally substituted for those that have been thus destroyed,) that will stand for a period in any way approximating to the durability of cast-iron?

Should there be any doubt on the mind of any one, as to the shortness of the durability of wood piles without such an expensive protection, let them go to the Chain Pier, to Shoreham harbour piers, and to our groynes, and examine the condition of some of those piles, not only as relates to the decay of that portion which is immersed in sea water, from the devastation occasioned by sea-lice, but the decay also of that portion which is above water from the effects of the dry-rot.

Or let them visit and revisit my model at the Town-hall of this place, and inspect specimens taken from two piles, one of fir, which has been fixed but for the short term of three years, and the other of beech, of five or six years' standing only, and let them judge, from the extensive ravages committed on them by sea-lice, if any unprotected wood structure would be either safe, suitable, or ultimately economical; and if protected, let them ask themselves or others the question, whether the additional cost of such protection will not render the immediate cost of the structure of far greater amount than the material which I have chosen, and whether

the customary external coating will preserve it from the destruction of the dry-rot within? With a view to ascertain the probable durability of cast-iron pipes constantly immersed in, or filled with, salt water, I have made inquiry at several of the principal baths in this town, how long their cast-iron suction-pipes last, sound and good? These pipes are laid for a considerable way under ground, and extend some distance into the sea; they are subject in some parts to external friction from the rising and falling of the tides, from the beating of waves, and from the collision of sand and gravel; they are, besides, always full of water, and subject to the internal friction of such as is drawn through them, as well as any action which such water is capable of producing on them: and, moreover, they are laid down without the least internal or external coating or protection. The answer received from Mahomed's bathing establishment was, that their pipes have been down twenty-two years, and there is no apparent defect or deterioration in them, and that they are still perfectly effective in operation. At Wood's baths, I was informed that the cast-iron pipes leading from their establishment to the palace had been down twenty-five years, and were still found in operation as effective as ever; nor were they aware of any decay in them, although they were constantly full of salt water, and that subject to continual change. At the other baths, their pipes had been down a shorter period, but all were in good condition. I have also consulted the oldest iron-founder in this place, and he states that there is a great difference in the quality of cast-iron, and that he would engage to put down cast-iron pipes, immersed in salt water, of such a quality as should last a century. The medium of protection which he recommends as preferable to any is, an admixture of boiled linseed oil, red-lead, and lamp-black.

Not having yet had time to make out plans and estimates of the probable cost for a definite amount of work with such materials, to enable others and myself to appreciate the comparative value of the system, against such modes of construction as are usually adopted for works comprised under the heading of this last subject of consideration, I am not prepared to furnish to the public that information which some may feel desirous to receive; but should any parties feel a wish to ascertain the cost for any particular work, I doubt not, but that on application, with the requisite information connected with the work required to be performed, I shall be enabled to furnish them with what they need.

I am fully aware, that to solicit the insertion of so long a communication to occupy your valuable space, on a subject, the greatest portion of which can be but of local interest, may justly be considered intrusive, yet, as the appropriation of the materials and the adoption of the principle recommended, may some day become of extensive application, I trust that the subject may also be found of general interest, and the expectation be deemed a sufficient apology for the request,

And am, Sir, your obedient servant,
GEORGE ADOLPHUS WIGNEY.

Brighton, February 19, 1842.

PROGRESS OF FOREIGN SCIENCE.

[We have made arrangements for giving, in a series of articles under this head, early notices of all the more remarkable discoveries, inventions, and improvements of our continental neighbours: and as the articles will be original, and procured at some cost, we hope that such of our contemporaries as may avail themselves of any of them will have the candour to acknowledge the source to which they are indebted.—ED. M. M.]

FRENCH ACADEMY OF SCIENCES.

M. Poncelet, whose works on Mechanics have made his name celebrated in England, is President of the Academy for this year; and M. Dumas has been elected Vice-President.

Resistance and Wear of Roads and Carriages.

A commission, named by the Academy, consisting of Arago, Poncelet, Coriolis, and Piobert, have reported on several memoirs presented by M. Morin, on the subject of the resistance to draft in wheel carriages, and the wear which they produce on roads. The subject is one of great importance to the engineer, and has occupied the attention, amongst our own countrymen, of Edgeworth, Rumford, and Macneil; and on the continent, of De Gerstner, Navier, Müller, Kronske, Fuss, and others: none of them, however, has, as yet, succeeded in developing experimentally the mathematical laws of the subject, nor has the present author been more successful. His results, however, are considered by the reporters as of considerable practical importance.

The report is by far too voluminous to be given at length. The principal results stated are as follow:—

1. The resistance to rolling produced by different sorts of ground, (or road surface,) in carriages, is proportionate to

sure, and inversely as the dia-
f the wheels.
ear of the road is greater in
ion as the wheels are smaller.
ds of compressible materials, as
and, gravel, &c., the wear and
istance to rolling decrease in
ion as the breadth of the wheel-
increased, and with all carriages
endent of the velocity.
ved roads, or ordinary stoned
en empierrement,) the resist-
nearly independent of the
of the tire, within certain
ind increases with, and is pro-
l to, the velocity. The aug-
on is less as the carriage is bet-
g (*i. e.* on springs) and the road
rm. At slow speeds, the re-
is the same for springed and
ged carriages.
ire results of M. Morin's first
ome of which, it may be ob-
not agree with those admitted
British engineers. The second
ontains his results as to the re-
veen the form of wheel and wear
d. The mode of experiment
is that proposed by M. Navier,
ausing the same load to pass
over the same track of road,
ing the depression. This me-
proposed by Navier in an able
ished by him in 1835, and little
Englishmen, entitled "Consi-
on the Principles of the Police
Carriages."
in's principal results in this
:—
qual loads, narrow tires degrade
iore than wide ones; but with
5,500 kilograms, and tires of
etres wide, the advantage of
a maximum, and beyond this
ems to be no use in augment-
width.
r set of experiments indicate
ith loads proportional to the
f the tires, the widest tires in-
road most.
qual loads and widths of tire,
injury results from the smallest

me load carried in two two-
carts produces less injury than
our-wheeled wagon.
nged wagon, at a trot pace,
s as little injury as an un-
one at a walking pace. The
speed in the former case was 3¼ leagues per hour.

The remainder of the memoir is occupied with experiments on the shock and resilience of elastic bodies, and is not so important. The difficulties of this subject, as an experimental one, are very great; and perhaps results taken from the actual working of certain suitable and defined lines of road for a long period, arrangements being made for the purpose, would be more likely to give correct information than any experiments made in the manner of M. Morin.

Water-proof Cloth.

M. Menotti's invention of a soap in solution, for the purpose of rendering cloths water-proof without stopping their pores to air, &c., was reported on favourably by a commission of the Academy, in January, 1840, and the subject has been again brought by him before this body. This invention of Menotti's is nearly, if not quite identical with that patented by Raper in this country, and both are alike useless. It is quite true that either of these plans, (if they differ,) or any one of many others of long anterior date, will enable cloth to resist water gently poured over it, but a very little rubbing or *sopping* of the cloth sends it through the fabric; so that, although a coat might bear a shower, say on the shoulders, it would wet through under the arms, &c., in a short time.

The principle of all the methods consists in fixing in the pores of the cloth either an oily matter, by decomposition of a soap, or an extremely divided powder, having little or no affinity for moisture. As yet, no water-proof cloth exists but that made so by India-rubber, or at least, none that will remain so.

Manna.

A substance has recently been introduced into commerce as manna, in France, but which does not possess all the properties for which that drug is valued. It is questionable whether the new substance is an artificial or natural product; and it has been examined chemically by Pelouze, and optically by M. Biot, by means of polarized light, according to his own peculiar method.

Mannite, the peculiar proximate principle to which manna (which is a secretion from certain trees of the genus *Fraxinus*) owes its efficacy, has scarcely any rotatory power on the polarized ray. The

solution of manna, however, like that of dextrine, or starch modified by the action of acids, causes the ray to deviate to the right of the observer, which arises from its containing a quantity of fermentable sugar. This renders the optical examination of this new sort of manna not quite decisive, as its effects on light are similar. This substance consists nearly wholly of fermentable sugar, very analogous to that produced by the action of acids on starch; and although it cannot be pronounced certain, it seems not improbable that this new sort of manna is, in fact, so made.

The Galvanometer.

M. Melloni has communicated to the Academy of Sciences a new method of varying at will the sensibility of his galvanometer, and, when desirable, greatly increasing its power of measuring minute electrical charges, and, by their means, minute changes of temperature. The paper is too long for extraction in an intelligible form, but will be read by electricians with great interest.

Causes of Explosion in Steam-boilers.

The formation of explosive mixtures of gas by decomposition of water in iron boilers, when in contact with red-hot plates, has been repeatedly urged as a cause of explosion; and as repeatedly has it been shown that, although possibly hydrogen might be thus produced, an explosive mixture could not, as the oxygen is not set free, but taken up by the iron while it oxidizes. M. Jobard, Director of the Museum of Manufactures at Brussels, has published a paper, in which he reasserts this to be a true cause of explosion, and gets over the difficulty as to oxygen by saying that atmospheric air takes its place; that, in fact, water cannot be decomposed unless the water be low in the boiler, which cannot happen unless the feed-pump be out of order, that is, not pumping water, but *pumping air* into the boiler.

He explains, then, the ignition of the inflammable compound to arise either from the contact of the red-hot plates, or from an electric spark produced by opening the safety-valve, and the steam rushing out.

It is now well known that a discharge of steam is accompanied with a powerful disturbance of electrical equilibrium; but it is not so evident how this is to produce a spark, in such circumstances as to ignite the supposed issuing volume of gases.

It requires a bar of iron to be nearly *white-hot*, before it will ignite an explosive mixture of gases. A more likely source for the air would be, apparently, that it is introduced into the boiler in *combination* with the feed-water, and there evolved on its being heated.

Some curious examples of explosion are cited by M. Jobard; among others, one of a boiler at Ghent, which was blown up while the man-lid was off, and the boiler about to be cleaned out. On the whole, as there is no doubt whatever that iron, aided by high pressure, (as, for instance, Perkins's Hot Water Apparatus,) will decompose water at temperatures even below ignition, it is quite possible that some explosions of boilers may have been due to this peculiar, but certainly most unlikely, combination of circumstances; while there can be equally little doubt that the vast majority have arisen from simple pressure of surcharged steam, a cause, however, which, M. Jobard will not admit under any circumstances; for he says, a boiler gradually overpowered by steam pressure rends at the joints, which first open, and give vent to water and steam. A complete treatise upon the causes of boiler explosions is yet a desideratum: every author hitherto has had some favourite crotchet to support, besides the main point of the matter.

The Artesian Well of Grenelle.

In a letter to M. Arago, Mr. Combes gives his opinion as to the causes of the singular flattening of the copper tube lately put down into the bore by M. Mulot, and which has caused so much trouble to get up again. It is pretty generally known already, that, after more than 600 feet of the copper tube intended to line the well had been got down, without any accident, suddenly, in one night, above 300 feet in length of the tube became compressed together flat, and twisted in various directions, grasping and retaining a spoon which had been before lowered down into it. The following is the theory of the phenomenon given by Mr. C. The inside of the jumper-hole had been previously lined with sheet-iron, at intervals, to support its sides. The water of the upper chalk continued to discharge large volumes of sand, which are supposed to have filled up and got wedged between the two tubes, and so stopped up all egress to the water in that way. As long as the water stood at the same level

d outside the tube, the pres-
uld balance each other, and no
uld result; but the water from
n of the chalk would carry up
ntities of solid matter also, and be
o frequent stoppages, obviously
y breakings-down, or wedging
les in motion in its subterranean
r. C. supposes, then, that the flow
in the inner tube was arrested;
evel of the water in it fell, tem-
much below that due to the
on the outside of the tube; that the
the upper chalk was then *corked*
en the tube and the sides of the
d that at this moment the sides
pper tube were crushed inwards.
ortion of the tube crushed was
ut 300 feet from the surface to
0 feet lower.

pplication of the Electrotype.

yré, of Versailles, has proposed
ation of the electrotype process
eems likely to be of value, viz.,
ltiplication of accurate graduated
nts. It is obvious that, if one
raduated scale of metal can be
hout injury, we may electrotype
n it, and others off them, *ad in-*
The costliness and rarity of
duation is well known to those
at all concerned with instru-
f precision. As a proof of the
f the process, very ample details
M. Peyré gives, he states that a
eotype plate, having a faint image
Christ of Michael Angelo, gave
es in copper, in which the design
pparent as in the original.

LIAMS'S SMOKELESS FURNACE—
PLY TO MR. ARMSTRONG.

-As Mr. Armstrong continues to
his unwarrantable statements, I
g permission to make a short reply.
attempts to neutralize the effect
admission that his report was
ed on erroneous data." The only
I shall make is, that I have the
onfidence in the statements made
solicitor, a wholly disinterested
t is quite true, the letter of recanta-
not written by Mr. A. himself. I
id it was: and your explanation,
note attached to Mr. A.'s letter,
any further observation on this
necessary. My assertion was,
that he had no grounds for stating that his conviction of the supposed injurious effects of my mode of admitting air to a furnace was, "forced upon him by a careful and unprejudiced examination of *several furnaces* constructed by Mr. Williams himself." His now triumphant answer is, that indeed he had seen *one* which was erected by the late firm of Brocklehurst and Company, and which, after a hasty examination, he ridiculed as a mere "peep-show affair," (see *Mec Mag*, April 17). Now, this statement alone, so different in substance from his "long attention, and careful examination of *several*"—is a sufficient refutation. But as to this one furnace to which he refers, I have to state,—1st. it was not constructed by me, and in several respects differed from my instructions; 2nd, it nevertheless was successful in its operations; and 3rd, it never caused any injury—its internal action completely negatived the expanding and contracting, heating and cooling process—and it ever continued to work satisfactorily. Thus, if the report was in any way influenced by the action of that furnace, it should have been the reverse of what it was. The object, however, was to throw discredit, in the garb of a matter-of-fact report, on my principle of admitting air to furnaces. I am sorry here to have it to say, this is no solitary instance of a prejudging determination to condemn, without enquiry, and on the part of those whose real interests would suggest the most rigid impartial examination. But the main allegation in Mr. A.'s letter is, that I threw the responsibility of the action of my furnace, in the case of Messrs. Hammett's boiler, on my agents. This, Sir, is the very reverse of the fact; for, as it was important to me to disprove Mr. A.'s statement, that my plan of admitting air was, and "ever would continue" to be injurious, I adopted the most decided measures on that head. I wrote several times to Mr. J. Woodiwiss (the acting partner) on this subject: and the following extracts from my letters will set this matter right:—

My letter of the 15th of December last, states, "I will, at my own expense, put the furnace in operation for any given number of days, which may be deemed advisable for testing the value of my system, and of proving to your entire satisfaction, that it is absolutely impossible

to injure a boiler by any operation of my system, so long as it is preserved in a proper state of cleanliness and with a due supply of water. The only condition I shall require is, that a water gauge be placed on the boiler, and by which the fireman can ascertain whether there is a sufficiency of water in it: and further, that until you are satisfied as to the safe working of the plan, I be allowed to have a confidential person to prevent any neglect," (I might have said—or foul play,) "as touching the supply of water. I will give you any guarantee as to the safety of the boiler." This, I think, will be admitted to be the *experimentum crucis:* for, had I failed, and had Mr. A.'s theory been correct, the question would have been at once and for ever settled, and to my discomfiture. Mr. Woodiwiss should at once have accepted the proposal, and Mr. Armstrong have advised it, as the best test to which his theory could have been subjected, and the surest annihilation of mine, if erroneous. But this offer, to take on myself the risk and responsibility, was declined, and uncourteously so. This was at least suspicious.

In my letter of the 27th of December, I said—"I repeat my proposal to re-open the air-pipe, and show you that no possible injury could be sustained by the admission of air, as alleged by Mr. A." Again—"I undertake to make this application without any expense to you—without any charge for patent right, and with a guarantee against *any, and all injury*, from such admission of air." I trust, Sir, this will be a sufficient answer to the allegation that I threw the responsibility on others. Suspecting, however, that there was some understanding between the parties, I brought this to the test, by adding, "If you refuse me, the world will say you have consented to the erroneous statement, and are, in fact, supporting Mr. Armstrong in his unjustifiable attempt to injure me." My last letter to Mr. Woodiwiss states that his refusal was perfectly satisfactory, and the public would know how to appreciate it. Mr. A. states, that I was present, and a "witness of its failure." I was present, and, on the contrary, witnessed its success. The alteration was one suggested by Mr. W. himself, namely, the stopping the action of *Stanley's feeding apparatus*, and which I at once had objected to, as defeating my principle; seeing, that by the action of Stanley's feeders, too thin a fire is maintained on the bars, and so large a quantity of air is drawn in from the front as effectually to obstruct the action of the air introduced in the proper place—from behind.

Mr. A., very *naively* observes, that his statements have been "verified to the satisfaction of every one who has chosen to enquire of the proprietors of the boiler in question." No doubt of it. But what say those who have enquired of other, and disinterested, and unprejudiced persons? Have they enquired of the respectable makers of the boiler? Have they enquired of those who have boilers in action on precisely the same principle—the Liverpool Water Works Company, for instance? For, if the theory be correct, it must produce similar effects under similar circumstances.

Now, there is a very important and useful consideration arising out of this discussion, and which, otherwise, would be very unsuitably placed in your scientific Magazine. I allude to the adoption of means for judging correctly, how far any system of combustion, or "smoke burning," or arrangement of furnaces, may be effective or otherwise; and which would enable the owners—the really interested parties—to judge for themselves, independently of the theoretical views and imaginary statements of patentees. As this is a matter of great practical value, I propose, (though out of the course I had determined on,) in my next communication, to go into the question, and show its absolute necessity.

I am, Sir, yours, &c.

C. W. WILLIAMS.

Liverpool, March 7, 1842.

Erratum.—In my last communication, page 187, line 19, for, "from 46°, to 476°," read "from 400° to 476°."

STEAM NAVIGATION OF THE ATLANTIC—LIVERPOOL AND BRISTOL LINES.

Sir,—I have just perused your extract from the *Bristol Magazine* in your number for January 1st, respecting the steam navigation of the Atlantic, and the rival lines of Bristol and Liverpool; and although I think with you that it is true "in the main," yet still it contains much exaggeration, and many of the facts have

ıtly distorted for the purpose of ' local interests."

h respect to the conveyance of ı American mails:—the Editor *ristol Magazine* would seem to that the government had made ›nage job" of it to serve their rests, and that they had abso- ·own away 35,000*l.* of the public Now, the facts are these: the ent having determined on carry- N. A. mails by steam, pitched verpool as the best port in the Kingdom for the packets to take ıarture from, being from its situ- ırer to, and in direct communi- ·ith Manchester, Birmingham, , Glasgow, &c., where about ths of the letters go from, and ı the great number of American hat enter the Mersey, the chief ur American trade. Having de- Liverpool, the contract for con- :he mails was offered publicly, British and North American 'acket Company offering the most ›le terms, the contract was given , and not to a company with a essel, sailing from a second-rate to a foreign one.

ith respect to the "wisdom of :rnment" in thus conferring the upon Liverpool:—the govern- ıd not only the "exigencies of ·office service" in view, but look- er farther than the Editor of the *Magazine*, they had also an eye elfare and benefit of the nation at 'or, in the contract, it was ex- stipulated, that the company provide four steamers of certain ›ns; and, that in case of war oc- with any foreign country, these were to be manned and armed in e manner as the navy steam-fri- ıd were to be placed at the abso- .trol and disposal of the govern- ıring the continuance of such war. ? the government had only the ıcies of the post-office service" in hat is the result? As far as re- ıe "speed" of the vessels, we t the Halifax boats, in fine wea- ve usually made the voyage home at port to Liverpool, in from ten l ten hours, to eleven days; while *at Western* takes from thirteen to ı days, although Halifax is many *farther to the northward* than *rk, and consequently the former* boats have to contend with the severer weather, which is generally experienced so far to the northward. As to the re- marks respecting the punctuality of the *Caledonia*, *Columbia*, &c., their deten- tion when they have been detained has always been satisfactorily accounted for, either from having experienced severe weather, which, as I have before ob- served, is not so often felt, and never so severely on the voyage from New York, as on that from Halifax, having met with icebergs, which is frequently the case, or else from having been detained by the government authorities to bring home despatches of importance.

3. With respect to the Editor of the *Bristol Magazine's* remarks regarding the voyages of the *Britannia and the Great Western* in October last, the causes of the delay of the former vessel are so well known, that it would be quite superfluous for me to make any remarks respecting it.

4. With regard to the delivery of let- ters *vid* Bristol:—if both the steamers were off Cape Clear at the same time, we will allow that it would take the *Bri- tannia* even ten hours longer to deliver her letters in Liverpool, than it would the *Great Western* hers in Bristol; letters from Bristol are absolutely thirty hours in reaching Liverpool by the re- gular post, that is, if they are posted in the former town on the 21st, in time for the evening despatch, they are not deli- vered till the morning of the 23rd in the latter town, thus losing *twenty* hours at least in the delivery. If the difference is so great with respect to Liverpool, it follows that it must be much greater with respect to the other towns I have men- tioned.

I have drawn my letter to such a length, that I have hardly room left to make any further remarks. Still, I cannot con- clude, without noticing the absurdity of supposing that government would give the contract to a company with a single vessel to convey mails of such import- ance; when, if an accident occurred to the vessel, the communication between the two countries would have to be sus- pended whilst she was undergoing her repairs.

Hoping, that in justice to this port, you will insert the foregoing remarks in your able and well-conducted Magazine,

I am, sir, yours very truly,

A. CLERK.

Liverpool, February 26, 1842.

PREVENTION OF SPONTANEOUS COMBUSTION ON BOARD OF VESSELS — MR. WILLIAMS'S EXPERIMENTS.

Sir,—I was very much pleased with the suggestion (p. 154) of placing pipes with small holes in them to admit air through the bulk of coals in steam-vessels; but I think, if the upright pipes were carried lower, and joined to other tubes running horizontally, it would be still better. About eight years ago, I made a very complete model upon the same principle; but my idea was, to prevent the heating of corn and potatoes in vessels, as it is a most remarkable fact, that a large quantity of both articles is completely wasted, if the voyage happens to be a long one. I took some trouble to show it to a few individuals whom I thought it would benefit; but no—it was all very well in its way, but the damaged food was no loss to them, and therefore they did not care about it. In carrying out my plan, I made a large box, something like the hull of a ship, with a double bottom pierced with small holes, with tubes going through the corn to the space between, and by forcing air with a piston down the tubes, it rose upwards again through the grain; and it was astonishing to see how soon wheat, well damped before putting into the box, was dried. I proposed that granary floors should also be done in this way, as it would save a good deal of turning; but the expense seemed to be a complete obstacle to any improvement in that quarter.

While writing, I cannot help congratulating Mr. Williams on the able manner in which he has detailed his several experiments, proving to a certainty the old saying, that the three-legged pot boils a great deal sooner than one that has no legs at all. Indeed, I have often observed, when a boy, the steam rising up with great fury in three places perpendicular to the legs. But it is not the man who sees such things and thinks no more about them that benefits mankind; it is he who turns them to real practical use, and thereby adds new stores of knowledge to the book of science.

I remain, Sir, your most obedient,

J. W.

THE HADDINGTON MARINE STEAM-ENGINE.

Sir,—I observe, in No. 968 of your useful and interesting Magazine, a description of an engine, (called the "Haddington Marine Steam-engine,) by Mr. James White, and beg to inform you that, in the year 1827, I saw a pair of marine engines, constructed in London by Mr. John Hague, on the same principle: they were of 40-horses power, and were erected on board a vessel called the *Thames*, which traded between London and Yarmouth for a considerable period. The engines to which I refer were put into the vessel in the place of, and same space previously occupied by, a pair of rotary engines, (which were made by some other party, and were inefficient,) and they worked quite satisfactorily, until the vessel, getting old, was broken up. The only difference between the engines made by Mr. Hague and the so-*called* Haddington engines was, that they had an intermediate shaft, and that the air-pumps were worked differently, taking up less space. I have documents and sketches in my possession, made in 1827, showing exactly the same arrangement of a drag-link to supersede the necessity of an intermediate shaft, and also sketches of a plan for working the air-pumps, as described in the drawing of the Haddington engine; but these plans were abandoned in order to bring in the old air-pumps and working gear, (which had belonged to the rotary engines,) without any alterations.

With respect to the stuffing-boxes, I can speak from experience of their working, that there was no more difficulty in keeping them tight, than in engines of the ordinary construction; and the piston-rods, although working downwards, were lubricated easily by a very simple contrivance.

I am, Sir,

Your obedient servant,

ENGINEER.

March 4, 1842.

FIRE-PREVENTIVE PLASTER—COL. MACERONE IN REPLY TO MR. BADDELEY.

Sir,—In No. 967, our worthy friend and your most valuable correspondent, Mr. Baddeley, has poured out the phials of his wrath upon my poor bald head. Mr. Baddeley is very much mistaken in his phrase "the determined hostility with which Colonel Macerone has all at once attacked the fire preventive plaster." I, sir, have no cause or feeling of "hostility" towards it; I have never seen their prospectus, and know none of the parties concerned in it; and if I did, had I been injured or offended by any of them, I should deem myself "a false knave" to squeak my penny trumpet in depreciation of any useful invention. What I predicated was, that our most flimsy trembling floors could not sustain *any* kind of plaster without its being cracked and destroyed by the said elasticity. I have seen plenty of floors covered with stucco as hard and polished as

marble, and walls of rooms also.
the floors are of beautiful sca-
n washed and rubbed with oil;
the construction is so stiff and
a troop of horse would not cause
The mansion of my uncle, Alex-
nieri, at Tusculum, above Frascati,
, had the walls of many rooms
h a cement which has the white-
lish of the finest marble. Some
l in fresco. Indeed, uncalcined
der is one of its chief ingredients.
were the same, and the only
nee is of disposing an *unwary*
fall incontinently on his or her
far from "determined hostility,"
to hear from so very competent a
as Mr. Baddeley, that this cement
sion to our means of security from
I must remark, as a practical man,
nder surface of deal stairs is far
e to be caught by the fire, than
; but I suppose the former will be
s well as the latter. The like may
the floor of a room *upon* which I
turned a large grate-full of bril-
which, without a drop of water,
t itself dead, only leaving a
oncavity in the boards. But all
gs will no doubt be duly borne in
the "Fire-preventive Company,"
I desire all possible success and

no shadow of a cause for depre-
merits of the patent cement, al-
r. Baddeley hints that he *could*
"*wherefore.*"
, the rooms are all stuccoed from
tom, and the floors are either of
painted, or of scagliola. The
rtains are generally of silk—the
none; the staircases are *all* of
I can vouch that from 1806 to
e was not a single house burnt in
00,000 inhabitants. The same in
e only "fire" during seventeen
that of a chimney in the house of
, the Marquis Lepri, brother-in-
orlonia, in whose mansion, next
eam caught fire, or rather was
its stupid propinquity to the said
I shudder when I think of the
on that occasion. I happened to
room at the time. I instantly
ret blanket before the fire-place;
n to the roof, and poured down
ckets of water. It was in Feb-
l, a hard frost. Part of the water
red the sloping roof *without pa-*
l formed a coat of ice. The least
have let me down into the street.
n urged me to come away, saying,
ot would burn itself out, (and so it *ought* to do in a well-constructed chimney). I called out for a wet blanket; they, with the fear of the icy roof before them, would not *bring* it; so as of old, as the mountain would not come to Mahomet, Mahomet went to the mountain; I crawled to them for the wet blanket, stuffed it into the chimney, and the fire was extinguished. It shows how very little used to fires the Romans were, when this little incident of a chimney on fire was the topic of general talk for months after, and I was decreed to be worthy of nothing less than an *ovation* for stuffing a wet blanket into a chimney! The only damage I received was the breaking of almost every nail off my fingers in holding on to the ice-covered tiles.

But I must not forget to say a word on Mr. Baddeley's sneer at my chemical analyzing knowledge. I do not pretend to an *operative* dexterity in chemical analyzing operations. It is many years since I possessed a competent laboratory or apparatus. The instrument I used upon the little bit of the patent cement, was my tongue. I may have been mistaken as to that which I took to be "Roman cement;" but, as to the barrel of size, I not only saw it open, but amply smelt it. I attach no blame or deceit to this. As Mr. Baddeley most justly says, "neither can the materials of which the fire-preventive cement is composed, be of any great consequence, so long as it retains the fire-resisting properties." To this paragraph I agree "*totiis viribus.*" It appears from Mr. Baddeley's letter, that pounded slate is the basis of this cement. Now, we all know that the base of slate is the earth called alumina. My grandfather, the Marquis Macerone, possessed the alum works of La Tolfa, near Civita Vecchia, six miles from Rome, where slate is superposed on a volcanic crust of our earth. The rising sulphuric acid penetrating the slate, produces sulphate of alumina; or, what in commerce is called alum. The alum is extracted from the slate by exposure to the air and aspersions with water, which water is then boiled till crystallization of the alum ensues. 15,000*l.* worth of alum were thus produced from my grandfather's slate mines of La Tolfa every year. But it would take too much of your valuable space to talk of alum, slate, &c. So I will conclude, by assuring Mr. Baddeley, that he is mistaken in his view of the sentiments of

F. Macerone.

P. S.—A friend has just told me, that a gentleman to whom I am under many obligations, and whom, rather than injure or offend I would cut off my hand, has an interest in this patent "Fire-preventive Company." This intimation has just come in time to prevent

me from sending you a long comprehensive article, long since written on the subject. By the bye, Mr. Baddeley will not, I hope, deny that the day before the experiment in South Lambeth, I saw "with my own eyes," an open barrel of size. I attach no importance to the fact, but merely speak in defence of my veracity. Why should I have said so, if not true? I have no rival patent or interest. It would be desirable if you, sir, or Mr. Baddeley, would invent or compound some English word to signify the burning of a house. "Fire" applies to a pistol; to the fire in the grate, or in a lady's or gentleman's eyes. But the French have *incendie*, which applies alone to tenements burnt. By the bye, I once heard an English lady in Paris, scold, the servant, and tell him, "*Le feu est allé dehors!*" The man stared, and was glad to see that the grate and chimney-piece had not gone out for a walk along with the fire.

February 20, 1842.

NOTES AND NOTICES.

The Smoke Nuisance.—We are glad to find that this important subject is at length beginning to be seriously entertained by the authorities of the different manufacturing districts, and the practicability of its prevention as generally admitted; the Lighting and Watching Commissioners of Bradford, a short time since, appointed a committee, consisting of Messrs. Broadbent, Smith, and Walker, to examine the various patent rights, &c., and to report the result of their labours. These gentlemen appear to have been most assiduous in their inquiries, and their report must be highly satisfactory to Mr. C. W. Williams, in particular, to whose invention they pay this tribute—"By this apparatus the consumption or prevention of smoke is complete, and a saving of 25 per cent. in coal effected." The apparatus of Mr. Hall is also well spoken of, as well as those of Mr. David Cheetham and Mr. Billingsley; and the committee, in concluding their report, state their unanimous opinion to be, that the nuisance of smoke can be entirely prevented, and that attended by a considerable saving of fuel.—*Mining Journal.*

Safety Beacon erected in the Goodwin Sands.—The following interesting account of this structure is contained in a letter from Captain Bullock to Captain Beaufort, hydrographer to the Admiralty, published in the *Athenæum*: "In carrying on the survey of the Thames, it was found expedient as the work proceeded seawards, and the receding landmarks grew indistinct, to erect fixed marks on the different sands. The first of them was nothing more than an iron bar driven into the sand, with a flag-staff affixed to it. This stood but a tide or two, and was succeeded by various modifications of the same simple plan, stays being added to support the shaft; but in vain; the marks erected in this manner all yielded to the first gale of wind. It then appeared that some foundation was wanted to enable them to resist the force of the waves. To remedy this defect, the bar was fixed in a broad cross of wood, from the extremities of which chains were attached to the staff, and after many trials success was attained by this means. The results of the experiments above related, joined to the knowledge of the lamentable loss of life annually taking place on the Goodwin Sands, induced the persuasion, that since it was found practicable to fix a Beacon on them, it was an imperative duty to erect one calculated for the preservation of life. The Safety Beacon now standing upon the Goodwin Sands, may be thus described:—The Shaft, or Mast,—40 feet in height and 12 inches in diameter, is sunk into the sand, through a strong frame of oak, in the form of a cross, firmly secured by four long bars of iron, and laden with several tons of ballast, chalk, &c. The mast is also sustained by eight chain shrouds, in pairs, and attached to iron piles, 17 feet long, which are driven close down into the sand, and are backed by mushroom anchors, to prevent their coming home, or towards the Mast. On the Shaft is fitted an Octagon Gallery, capable of holding thirty or forty people, and never less than 16 feet above high-water mark; beneath the gallery there is temporary safety for twenty persons more. The Mast is also fitted with a light topmast, on which a blue flag (always at hand) can be hoisted, when aid is required from the shore, but which is kept struck, or down, to give the whole an appearance of a wreck, thus answering the double purpose of a Beacon of Warning and a Place of Refuge. Directions are given in eight languages, and bread and water with a small supply of spirits, are left upon the Beacon, properly protected from the weather. To the Beacon is also appended a chain ladder of easy ascent, as well as cleats to the Mast, and a large basket chair is kept in readiness, with ropes and blocks to succour the exhausted."

Cooking Carnelians.—The carnelian is a beautiful illustration of change. This beautiful gem embraces every colour, from the pale fine yellow of sulphur to the deepest crimson; its opacity varies from the dull and coarse texture common to other stones, to the exquisite fineness of garnet. But what is it in its state of nature, before it is dragged to the light of day? A dull, worthless, flinty substance, similar to the agate, varying in its colour, and, sometimes in its material. The ignorant native of India, who is no geologist—who knows not what philosophy means—but, simply excited by his cupidity alone, abstracts the worthless stone from the earth, and, placing it on some elevated spot, suffers it to remain on the surface of the earth for three years, at the expiration of which period, he boils the stone for several hours, in order to expedite the result, and to check its further changes. In the cutting we acknowledge Carnelian, one of the most becoming and beautiful ornaments of the female sex, although, from its abundance, but held in light esteem. Again, to anticipate the slow operation of natural causes, these uncultivated people inclose the unripe stones in a vessel of earth, and, in this state, expose it to artificial heat; thus, in a few days, the like result is obtained.—*Correspondent of the Mining Journal.*

Adams's Bow Springs and Spring Buffers are stated in a Hamburgh paper to have been adopted in the Hamburgh and Bergsdorf railway, and with great advantage as regards both "ease of motion and absence of noise."

City Fire Escapes.—At a Court of Common Council held on Monday, February 28, Mr. Lott wished to know whether any opportunity had occurred, for putting the *Fire-escapes* ordered by the Corporation, to the test? He wished to hear something upon the subject, which, although of such immense importance, seemed to have dropped into oblivion. Mr. Hicks, said that three escapes had been made, and the police commissioner and Mr. Braidwood of the Fire-brigade had been made acquainted with that fact. So much for Corporation progress!

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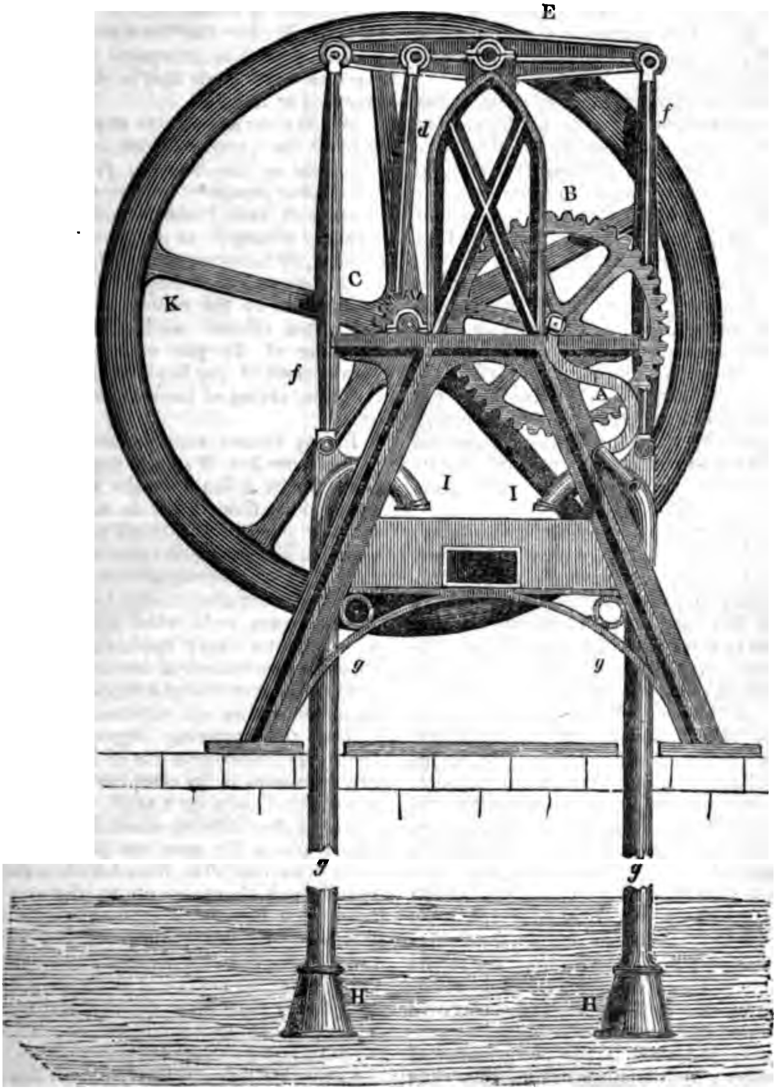
WALKER'S HYDRAULIC ENGINE.



WALKER'S HYDRAULIC ENGINE.

Sir,—There is, perhaps, scarcely any matter in engineering science that has engaged so large a share of attention as the art of raising water. The diversified expedients resorted to for this purpose, prior to the invention of the pump by Ctesebes, and the attempts that have been subsequently made to improve upon this important instrument, would fill a goodly volume, replete with interest and instruction.

Without entering into any examination of the comparative merits of the present most popular contrivances for this purpose, I propose in this paper simply to complete what I began in your 34th volume, (page 377,) viz., a description of the novel and ingenious "Water Elevator," patented by Mr. Walker. In that communication I briefly described Mr. Walker's apparatus in its simplest form, and noticed its extraordinary capabilities—extraordinary, because, if that description had appeared anonymously, the whole matter would have been put down as a hoax! My plain unvarnished tale, however, having a name appended to it that was at least a guarantee for its authenticity, was received with some degree of attention.

So apparently mysterious, however, was the action of this novel apparatus, that curiosity was strongly excited respecting it. In illustration of this, I may just mention a circumstance that came to my knowledge. A party of gentlemen, in Suffolk, entered into a subscription to enable one of their number to come to town to examine and report upon this phenomenon. Accordingly, he waited upon Mr. Walker, who, in his usual candid and unpretending manner, exhibited the machine in operation, and explained the nature of its action: furnishing satisfactory proofs of all that he advanced. The gentleman saw, and wondered; he was of necessity convinced: but, said he to Mr. Walker, "you must please to let me have one of these machines to take back with me; my report alone will be unavailing—seeing is believing—but nothing short of seeing will carry conviction in this business."

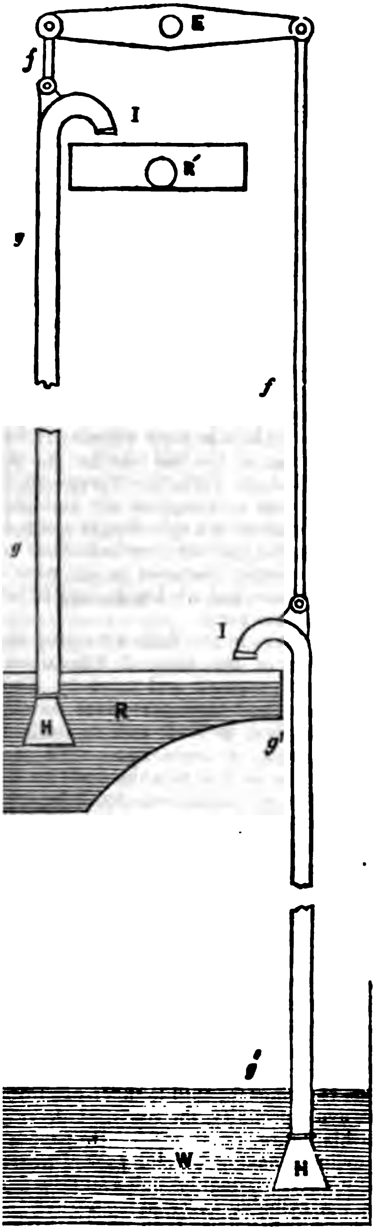
So paradoxical is the performance of Walker's hydraulic apparatus, that *skilful and intelligent* engineers have been *completely astounded* by it, and have been wholly unable to comprehend its *modus operandi*. Some have even disbelieved their own eye-sight, and denied the possibility of raising water by the mere use of *a pump-barrel with a valve at its lower extremity*. So strong has been the belief that there is some sort of legerdemain at the bottom of the affair, that Mr. Walker has been compelled to prepare a machine composed entirely of glass, to demonstrate that no deception is practised or intended.

Mr. Walker's apparatus steps in as if to settle the question which some years since was so rife between *friction* and *frictionless* pumps*—to show the perfect inutility of both "scrape and go" and "rolling pistons;" to put them both out of court, by demonstrating that, in reality, *no piston at all is required!* If the substitution of the rolling for the sliding piston effected, as has been stated, a saving of 73 per cent., dispensing with pistons of any kind may, of course, claim the saving of the remaining 27 per cent.

In my former communication I explained that Mr. Walker's apparatus depends for its action upon the momentum acquired by fluids when in motion, and that the patentee was about to construct some machines upon a large scale, to be worked by suitable mechanism; several of these have been completed to be worked by manual power, or by wind, and forwarded to climates where machinery for this purpose, constructed of less durable materials, has been found a subject of continual annoyance and expense.

The accompanying engraving (see front page) represents one of Mr. Walker's Elevators in its complete form. A is a winch-handle on a shaft, which carries a toothed driving-wheel B, working into a pinion C; upon the pinion-shaft there is an eccentric, from which a connecting-rod *d*, passes up to the overhead beam E.* From each extremity of the beam E, two pump-rods *ff*, pass down to the two elevators, or water cylinders, *gg*, which may be of any convenient length, say from 30 to 40 feet, and from $1\frac{1}{2}$ to 3 inches in diameter; these

* By the bye, the expiration of Shalders's Patent, three years since, does not seem to have tempted any other manufacturer to adopt his wonder-working contrivance.



cylinders are closed at their lower extremity H, by valves opening upward.

On turning the handle A, a rapid motion is given to the pinion-shaft and eccentric, which has an inch and a half throw; the connecting-rod *d*, being attached intermediately to the beam E, a throw of three inches is given to the elevators, which, thus receiving a rapid alternating motion, deliver a stream of water from their nosels I, into the cistern or receptacle, from which it flows in any required direction. The second engraving shows an arrangement for drawing water by means of this apparatus, from wells of a greater depth than could be advantageously accomplished by a single lift. E is the working beam to which two elevators are attached, the first, *gg*, raising water from the reservoir R, into R′, the former being supplied by the second elevator *g′g′*, from the well W.

The pinion-shaft is in some cases fitted with two, three, or more eccentrics, which give motion to a corresponding number of elevators contained within the same frame, so as greatly to increase the power of the engine, without adding much to its bulk. It will be apparent that as the one elevator, with its contained column of water, is exactly counterbalanced by the other, the machine is constantly in a state of perfect dynamic equilibrium, and therefore the motion communicated to the machinery, and thence to the fluid, produces a direct action, raising the largest quantity of water with the smallest possible expenditure of power.

What the capabilities of this engine may eventually prove to be, remains to be ascertained; in the machines already completed, the quantity of water raised far exceeded the performances of any description of pump hitherto employed; but as none of the machines were sufficiently large to employ the whole power of a man, mechanically considered, no data have yet been obtained upon which to found any calculations.

As the matter progresses, however I shall have much pleasure in communicating the results, and remain, Sir,

Yours respectfully,

W. Baddeley.

HYDRO-PNEUMATIC BUFFERS.

Sir,—In the February Part of the *Mechanics' Magazine*, which has just reached me, I find two articles having reference to my Hydro-pneumatic Buffers, described in the No. 956, for December last, the first signed "N. N. L.," the second, "E. Heydn," whom I presume to be the person who has been for some time shop-foreman in the carriage department of the Dublin and Kingston Railway Company's repairing establishment. I dislike, extremely, what is usually termed controversy, which seldom has truth for its object; and should not now ask a place in your pages for a few remarks upon these communications, did not the latter contain averments and insinuations of plagiarism on my part, which are as untrue as they are ungracefully put forward, and which I beg permission, in the first instance, to refute.

Some time in December, 1835, or January, 1836, a Mr. Dawson, a highly-intelligent coach-maker of this city, called upon me to enquire the cost of a cast-iron cylinder with open ends, bored true, about 4 feet long, and 4 or 5 inches diameter, which he stated he wanted for an experimental purpose. I had known Mr. Dawson as a railway carriage builder previously, and almost my immediate reply to him was, "that I could guess what the experiment was—that he intended it for an air-buffer;" and I then at once told him that I had previously given the subject some attention—that air-springs for various purposes of draft, &c., had been long ago proposed—that they never had been made to answer, in consequence of the impracticability of making a piston or stuffing box air-tight—and that I considered the only road to success was, to confine the air by a liquid, such as water. I further, on the moment, sketched the general plan for the hydro-pneumatic buffer, such as it was afterwards executed.

Mr. Dawson had asked the cost merely of a bored cylinder: he *now* admitted it was for an air-buffer, and that his plan was simply a piston on the middle of a rod passing through stuffing-boxes in the otherwise close ends of the cylinder.

Having made proper drawings of my scheme, I showed them to Mr. Dawson, who agreed to make the experiment on *my plan, I guaranteeing* the cost not to *exceed a certain sum.* The apparatus was executed, and put to work by me, as already stated, without improvement or suggestion on the part of Mr. Dawson or any one else; and the actual cost was nearly double that guaranteed and paid by that gentleman.

I am, hence, not indebted to Mr. Dawson, Mr. Heydn, or any other individual, either for the distinguishing principle, or for any one of the details of this sort of buffer, which I am therefore justified in calling MY *hydro-pneumatic buffer;* and the full right and title of inventorship to which I thus formally reclaim.

What claim Mr. Heydn may sustain to having been the proposer of the plan meditated by Mr. Dawson I do not know; but I have no recollection of Mr. D.'s ever mentioning his name to me in connexion with it, (although I believe he was then employed by him in some capacity;) but granting Mr. H. the full credit of it—admitting that, in 1835, he "proposed to have a piston to compress air at atmospheric pressure in a cylinder, as a simple substitute for railway coach-buffers"—then he simply proposed to do what a score of others had tried to do, and failed, before he was born.

Air springs in this form were proposed in France in the time of Vaucanson; they were proposed and tried by Edgworth on wheel-carriages—were *patented*, as applied to draft and to harness, twenty years, or more, ago—were proposed to be used to ease the draft on the track-lines of canal boats by, I believe, Sir John Robison—are mentioned by Dr. Gregory—and had been talked of as applicable to buffing, by me, to various engineers, long prior to 1835, to whom I found the idea was by no means new, but who all concurred with me, that the impracticability of confining the air was a fatal objection. So much for the originality, even of the crude and imperfect notion; but now let us for a moment consider the "decided improvement," the plan of plans, which in the year 1842 Mr. H. brings forward to supersede mine. To avoid prolixity, the reader must refer to his figure, (page 139.) He proposes a cylinder having a solid packed piston, with a rod passing through a stuffing-box in the cylinder cover at either end, a valve opening inwards in the middle of the length, and a safety-valve outwards. Now, I omit all consideration of the pro-

of this affair, or of its details. I myself to a single point; and I hat, before a buffer of this sort work one week, both pistons e found as near as they could get r, about the middle of the cylin- d why? Neither the pistons nor fing-boxes *can be made air-tight;* nce, although the blow may be nentary, (which is not admitted, r,) yet at *every* blow a small of air would make its way out middle portion of the cylinder, piston, and get between it and nder cover, and there being no- remove this again, and its quan- g continually increased at every he two pistons would soon get vingly together in the middle. ume this not to be the case—as- s Mr. H. does, that his pistons olutely air-tight—then, what is of his valve opening inwards? o air can escape from the cylin- t by passing the said air-tight and the cylinder is already full, can be drawn into it, after ap- and on separation of the pistons, he valve is useless, unless as an to the preposterous safety-valve. re therefore a very pretty speci- reasoning in a circle. What the writer means by the "*rarefied* air entre," on "the *approximation* pistons," is hard to say, unless, n Hibernian, he mean "*con-*" when he says "rarefied:" this more probable, as he ingeniously is pistons, when relieved from a *collapse*"—that is, they *collapse rom one another!*

enough of Mr. H.'s *invention.* s to his observations on my buffer upon the Dublin and Kingston , it might be enough for me to that I lost sight of it and the sub- d that, had I not thought the construction needed improve- would not have designed those ently proposed by me. The first ever tried it along the line was e carriage alone, after an en- which there was no one but Mr. of the Dublin and Kingston , and myself. On suddenly stop- nd starting, the check was no ard; but not more so than with *rgin's own buffers under similar tances, viz., the traction of a* single empty carriage, violently started, and as violently stopped; but I on two or three occasions travelled in it as part of a train, and could perceive no differ- ence in the buffing from the other car- riages.

There is no doubt the friction of the cupped leather piston was too great, and hence, that the piston would commonly remain, perhaps, at three or four inches to one or the other side of the middle of the cylinder; but this is perfectly unim- portant.

The air-vessels were under the seats, and *not* inconvenient: the weight of the whole apparatus, full, was only about 9½ cwt.; and hence, any objection on this score is preposterous, especially on a line where some of their first class car- riages have six wheels, and six or more huge springs, and solid 2½-inch round iron buffer-rods; while this affair was in one of the worst and oldest of their light third-class carriages, which, if still in ex- istence, must be a truly venerable article, but probably is so only in the sense in which a gun remains the same which has had a new lock, stock, and barrel; or in which it is said, the king never dies. It is quite likely the stuffing-boxes often leaked water for want of attention; but if they did, how much more would Mr. H.'s stuffing-boxes leak *air?*

I need not, however, pursue his re- marks on this part of the subject farther: their ill-nature is as transparent as their irrelevancy to *the principle* in question, which is, the rendering an elastic fluid confinable as a spring by means of a liquid; and not whether the details of the method by which this was first at- tempted were perfect or not. I must add, however, that Mr. H.'s observation, that its being on the Kingston line, in the midst of a different system, was only so in *form,* and not in *system,* &c., is founding a sophism upon a wilful mis- construction of my words. True, it was, as I stated, a "thorough buffer," but different in structure and management from every other buffer on the line; and, I will add, capable of bearing shocks that none of them could stand.

The succeeding observations about my proposed upper, or top buffer, are scarcely worth criticism. Either I have been very obscure—or this writer is so ob- tuse, as to have wholly mistaken the very ground of my proposal. I am so fully

convinced, that a "coach body" will withstand no shock, that the very aim of my plan is to provide something in its place that will, and place *it* so as to receive the shock. The lever of the "first order," is very learned, though somewhat out of date as mechanics now stand; but, unfortunately, it should be, "a lever of the second order," as here talked of. Neither is there any mistake about the place of the centre of gravity of a *loaded* railway carriage, as, if necessary, I shall take occasion to prove, with permission, in your pages. Mr. H. leaves out, "loaded:" perhaps this seems to him unimportant! Mr. H. can state from much experience, "that in nine cases out of ten, whatever be the nature of a collision to a railway train, the coaches are never totally upset" Did Mr. H. ever see a collision, or the results of one, beyond the precincts of the Dublin and Kingston Railway? Never. How many collisions have there been upon it? *Two*, or *three* at most. This is the "much experience" from which he makes an induction of *nine cases out of ten;* and it may be questioned, did he ever witness *these* two or three collisions? I did not. Yet, I am credibly informed, that in one of them, some of the carriages were thrown right over the others, —and why? Because the buffers were below the centre of gravity, and there was no resistance to motion above that point. A capsizing, or throwing off the rails, has attended every known collision. Mr. H. does *not* know, but other people do, that what is called a "statical couple," cannot be equilibrated by any *one* force, or by any number of forces, applied at *one point*, or in a line at right angles to the arm of the couple. Yet, this is what is attempted to be done by the present arrangement of buffers of whatever system.

All that is said about the necessity of the top buffer on my plan being of equal size and strength with the lower ones, only shows the writer's imperfect comprehension of the subject, as must be evident to every competent judge, *i. e.*, to every mechanic who unites theory to practice.

I regret to have occupied your pages at such length, with matter comparatively uninstructive to read, and disagreeable to me to be obliged to write—and willingly turn to your correspondent "N. L.," whose gentlemanly style is in pleasant contrast with that of the paper just considered. There is a great deal of ingenuity in the plan proposed by this gentleman, for *buffing* the recoil of the buffer, by bringing it up against a second body of air; but it is a provision against an evil that does not exist in practice. No such thing actually occurs, (even in a large model,) as the plunger being driven out against the fillet of the cylinder with a sudden shock—or concussion—and for two reasons. In the first place, in the case of collision of two such buffers (say in train), the driven-in plunger cannot return outwards faster than the opposing buffer or plunger, permits it by resilience from it; but as both buffers are *imperfectly* elastic bodies, this velocity cannot be as great as that with which the plungers were driven. Further, the resilience of the buffer impinged upon, has a tendency to move uniformly, while the return stroke, or motion outwards of the impinging buffer, has a tendency to accelerated motion. Lastly, the friction of the stuffing-box gland is at all times enough to prevent any perceptible blow on the fillets, although unaided by the two former causes of retardation. The fillets, I should have stated, also have a collar of leather between them, against which they mutually abut.

But supposing that these were real conditions to be provided for, I much fear—indeed I feel authorized to affirm—that the method proposed would not meet the difficulty. First, because the centre diaphragm, or piston, could not be kept tight, being nearly inaccessible, and because the glands could not be even made tight from the practical difficulty of adjusting three perfectly coincident bearings on an absolutely rigid bar, such as the plunger is: the greatest practical difficulties also would attend the equation of the glands, and their necessary packing and fillets in connection with such a cylinder, the bore of which, and hence the diameter of the piston, being larger than that of the end glands inside the fillets.

All the moving parts requiring attention, &c., would be doubled in number, and more than doubled in liability to derangement, and it would be very difficult to attach the outer cylinder to the under carriage in a substantial manner,

.ve it free at both ends. These mere practical objections in detail, however, seem to me conclusive, : inapplicability of the contrivance, it were necessary, which it is not. an is, nevertheless, ingenious, and ly correct in principle.

in place of being a better fluid se buffers than water, is about :st possible; it is nearly as hard to as the air itself, and will break joints which are perfectly water- nor has it any advantage in lubri- the parts: the packing of the is steeped in tallow and palm oil, always preserve a greasy coat on nger, which the water, of course, ot remove.

:rever the climate is such as to er the freezing of the water in ffers, then *brine* is the proper . *e.*, a saturated solution of com- lt, which requires a very low tem- e to freeze, and has no cor- action on iron whatever, because ains no combined air, as I have in another place. All oils get nd viscous at moderately low tem- res, say 35° Fahr.

onclusion, while I am conscious of bestowed some care and thought the subject of these buffers, and re have not advanced crudities : of immediate or obvious amelio- still I am equally conscious that v method was ever made perfect repeated trials, practice, and emen- ;. The principle I have submitted public, together with the best I at present know of carrying it ıd no one will be better pleased to em improved, than, Sir, your obe- ervant,

ROBERT MALLET.

IE MANAGEMENT OF FURNACES BOILERS. BY C. W. WILLIAMS,

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-In my last communication, I al- to the absolute necessity for inter- pection before any correct estimate e formed of the value or effect of smoke-burning" or smoke-preven- ıvention, or the extent to which ıstion may take place in any fur- Had the owners of boilers and es been hitherto enabled to make wn *observations—to see* with their own eyes, and judge by the light of their own common sense—most of the absurdities of the present day would long since have passed into oblivion. Having however no other guide but the *dicta* of inventors, and seeing how utterly we are without the means of detecting the chemical or practical errors on which inventions are frequently based; the boldest assertor too often obtains the most encouragement, while he is himself, perhaps, deceived by occasional success, the result of causes over which he had no control, or of which, perhaps, he had no conception.

Under these circumstances, many plans which proceed on wholly erroneous principles, continue to be pressed on the unsuspecting public, while others, possessing real merit, are rejected, from the want of suitable means for estimating their qualifications. In the absence of internal inspection and observation, no plan should be sanctioned as efficient, or rejected as unsound; seeing how the supposed merit of the one may be dependent on unascertained, unsuspected, or partial causes, while the supposed defect of the other, may be the result of accident, omission, or local circumstances — all of which, however, would have been instantly detected had suitable means of inspection been afforded. Of these, I will hereafter give some illustrations.

At present, we have no test of the working of any "smoke-burning" expedient, but the appearance or disappearance of the black cloud at the top of the chimney; yet this absence of visible smoke, may really be the result of injudicious and even wasteful expedients, or the passing off of the combustible matter in an invisible, rather than a visible form. For as to drawing any correct inferences from occasional results, while we are yet unable to ascertain or determine the causes which produce them, it is but a species of self-deception, in which we would most likely be setting down to principle, what, if we had the means of judging correctly, would be found attributable to merely local or accidental causes. Thus, we are often unconsciously the means of perpetuating error and fallacy; and hence, also, the discrepancy between the results attributed, by different experimenters, to one and the same plan or process.

Had we the means of observing what is really taking place in the interior of furnaces and flues—of ascertaining what kinds of gas are generated during the successive stages of the process — to what extent they enter into combustion: whether visible or invisible smoke be generated—to what extent, at what times, and from what causes: were we enabled to observe the effect of admitting or excluding air—and above all, of ascertaining the varying degrees of heat produced during these several stages and processes, we would then be in a position to appreciate merit or detect fallacy; and thus decide between truth and error. Now the obtaining correct information on all these points is strictly within our reach.

Again, as to the evaporative power of any particular kind of fuel; with such means of inspection, positive results would be obtained, whereas we are at present dependent on the care, judgment, or prejudices—too often the neglect or evil intentions—of a mere fireman, since much of the result of any trial is absolutely under his control, (as will be shown hereafter,) in the absence of the means of that personal inspection and observation, which would have enabled the proprietor to detect the causes of apparent success on the one hand, or apparent failure on the other. Under the conviction of the value and even necessity of being enabled to form a correct opinion in such cases, I propose showing how the proprietors of works may, with a *minimum* of trouble and care, be qualified to judge for themselves, and correct the misstatements of interested parties, who would palm upon them some ingenious, but insufficient scheme.

I will now describe the various changes and effects produced in a furnace and its flues from the throwing on of a fresh charge of coal until it is exhausted, and another charge be required; of the correctness of which all can form an opinion.

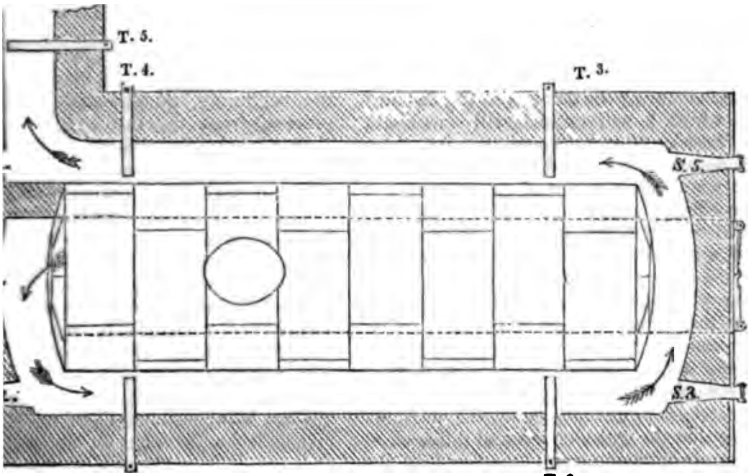
Let the annexed engraving represent a cylindrical boiler 15 feet long, (the length of that from which I have drawn the following facts,) set over a furnace furnished with the means of admitting air in the proper manner, or of shutting it off at will, for the purpose of noting the varying results. To enable the operator to observe all that is going on in the interior, five glazed spy-holes, or windows, are provided, as shown at S 1, 2, 3, 4, and 5. By means of the centre one, S 1, placed exactly opposite to, and in the line of the furnace, a distinct view is obtained of what takes place behind the bridge, and even in the furnace itself. This is the most important spot for observation. By S 2 and 3 a view is obtained quite through the left-hand flue; and by S 4 and 5 through that at the right hand. The being thus enabled to see, not only *into*, but *through* the flues, is of the greatest importance, as will be shown hereafter.

By these means we are qualified to judge of all matters depending on sight; as, for instance, the length, quantity, and colour of the flame—the alternations in the production of flame or smoke—the particular time and circumstances under which such changes take place, and so on; and when we consider how accurate a test is *colour*—indeed, how often it is the only test, as to the nature of the gas in combustion, and hence the quantity of air required or of heat produced—the value of this *visible* test will be duly appreciated. Indeed, without the means of knowing what colour the flame assumes, the chemist will inform us it is frequently impossible to decide what species of gas is coming over—at what rate, and in what proportions, they succeed each other — and to what extent they are inflamed. Now this succession of consecutive changes, and their relative effects, forms one of the most instructive and influential objects of inquiry in estimating the operations of the furnace.

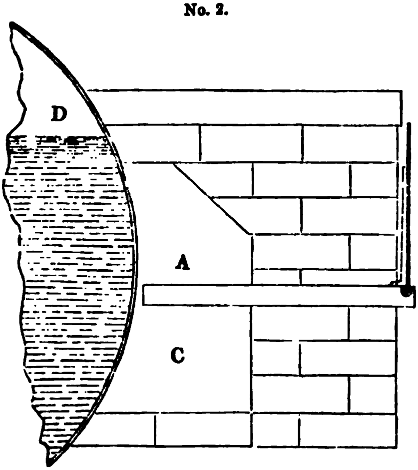
So far as ocular demonstration is required, we have thus ample means of detecting errors and drawing correct inferences. As, however, it is absolutely necessary that we should be enabled not only to *see*, but *feel*, additional means of information must be supplied. For instance, it is essential we should know what influence the several changes and processes going on in the furnace may exercise as to temperature, and all that belongs to heating and cooling. On these points, the required information may be obtained, approximatively, if not absolutely, by means of thermometers, ranged in the most suitable places, as shown in the annexed engraving, at T 1, 2, 3, 4, and 5. These thermometers are attached to copper bars, as will hereafter be described; the bars being thrust into the flues at

laces pointed out. Bars 1 and 2 te the temperature in the left-hand and 3 and 4, that in the right-hand Thermometer bar No. 5, (unquesly the most important,) is situated end of the flue where it enters the chimney shaft, where it will indicate the amount of waste heat, inasmuch as the heat which this part of the flue contains, beyond what is required for maintaining the necessary draught, is as much an absolute loss, as if the fuel from which

No. 1.



No. 2.



A. Conductor-bar.
B. Thermometer.
C. Flue.
D. Water in boiler.

heat was produced had been wasted, out passing through the furnace. where is the difference between ing the fuel, in the first instance, wasting the heat which such fuel luces? This thermometer, then, may aken as the index of the quantity eat *wasted, and, therefore,* of an insufficiency somewhere, by which such waste has been incurred.

Now, supposing the furnace to be in full action, with a fresh charge thrown on the body of ignited fuel on the bars, and when in the proper state (of which more must be said hereafter) the first effect, as to temperature, will be a cool-

ing one. This is caused by the evaporation of the water or moisture, which is more or less contained in all coal. The presence of this moisture, with its cooling effect, is not, however, to be considered as an evil unaccompanied by a commensurate good. This will be explained as we proceed. After exhibiting a diminished temperature for some minutes, the thermometers begin to rise, as the coal gas (carburetted hydrogen) then evolving from the coal enters into combustion. The colour of the flame, and the distance to which it will extend, will now begin to indicate the nature and quantity of gas generated, and the degree of perfection in which the process of combustion will be effected; while this latter, in its turn, will be dependent on the degree and rate of diffusion which takes place between the atoms of the gas and those of the air: the whole, in fact, depending not so much on the quantity of air introduced, as on *the mode* of its introduction; and this is the point which practical "smoke burners" overlook, but which is beside our present question. I am here, however, presuming that the introduction and diffusion of the air with the gas, is managed in the most efficient manner behind the bridge.

Accordingly, as the air is introduced, properly or improperly, we find the colour of the flame will now become an index of the temperature in the flues; and, in this respect, we shall have under command all the changes and appearances which the Argand gas-burner or oil lamp exhibits; from the extreme of a dark, murky red, with a reduced temperature, up to a clear, brilliant white, with an intense heat; these varied effects being produced by the action of the air-valve, in the same manner, and with equal rapidity, as in the lamp, when we check the admission of air by the centre orifice. If, however, due means be not provided by which these changes of colour and intensity can be seen and compared, how can we venture, while thus literally in the dark, to pronounce on the causes of such changes? As well might we suppose that the Argand burner or lamp could have been perfected, if the experimenters had been prevented seeing and comparing the effects produced, and tracing each to its proper cause. On this head we may also be assured, that as colour is closely allied to intensity, in the nature of flame, much of what is said on this subject is equally applicable combustion of coal gas in the fur in the lamp. As the combusti ceeds, the length of the flame w the proportion to the quantity generated. This, however, i more equable than might be su and, to a great extent, is gove the mode of feeding and the di of the flues.

An important question here a specting the quantity of air adı the beginning, middle, and en process, from the throwing on charge, to the time when anoth required. Much has been sai subject, and many objection against the absence of a regulati by which the quantity of air adm be in proportion to the quanti evolved. This branch of the a highly important one, and ca determined when we have so correct data before us; I will n fore, enter on it at present, the being, in fact, one of expedien balance between the evils of a mechanical adjustment on the c and the inconveniences of th being occasionally *plus* or *minu* act quantity required. Objecti ever, against the giving somet system to the admission of air, may not be complete, and in pe mony with the supposed suppl mand, come with a bad grace fı who have not only overlooked absence of all regulation and to the admission of air in ordi naces, but advocate—what is opposed to chemistry and na compelling the supply of air, the gaseous and solid portior fuel, to enter by one and channel, namely, the ash-pit and which any adjustment of the equivalents is rendered absolu practicable. And if a regulat ciple be necessary, when both chanical and chemical impedim ing out of a single orifice of a are removed, *à fortiori*, it will so when the whole supply is co the ash-pit alone, with its eve obstructions and facilities, arisi the states of the furnace, and t ating quantity of fuel on it. In new-born zeal for a controlling lating influence, seems stran

hose who advocate the prevail- the prominent and admitted 'hich is, that exactly when the ıtity of gas is evolved from a e of coal, the smallest quan- enabled to enter through the son of the obstruction which creates.

round, then, I might be ex- rowing the *onus* on them of ıe suitable means of adjust- en, however, I come to treat applies of air, I shall be able actically, how they aid each ng far towards accomplishing haps may be desirable. But

erations of our furnace pro- mperatures indicated by the nometers will be in the ratio conveyed by the currents of lucts in the flues, at their se- ıs, and the quantities ab- absorbed by the boiler-plate ɔin their respective divisions. ınd valuable information will by observing these propor- he periods of their relative

he construction of the flues, cumstances, which we cannot examine, the surfaces be not absorption of the heat gene- : furnace, the excess, (which ıte and *pro tanto* loss,) will by the thermometer No. 5. e have a new and important ervation, and one which has n too much neglected. In 'iations of internal tempera- the thermometers exhibit ent modes of firing, different l, different modes of manag- : fuel, different states of the and, above all, different mitting or excluding the air, e how little reliance can be ıy calculation of results, un- ıntity of heat thus passing retrievably lost, be taken into ; this amount of waste or being, in fact, an important he inquiry.

aborate report of Dr. Scha- 'layer's boiler, we see how lt embarrassed by this ques- : difficulty of estimating its calorific value, ranging as it did from 230° to 600°, and of course not knowing how much it exceeded that point, from the want of a correct pyrometer. In many of the reports on boilers by Mr. Parkes, we find him embarrassed by the same difficulty—conscious of the heating power he was losing, yet unable to bring it to account. In the experiments by Dr. Fyfe on the evaporative power of coal, the temperature of the escaping gases, or the quantity which passed away in the form of smoke, were wholly neglected. Yet we find him making his calculations exclusively on the other elements of the inquiry, and on these manifestly insufficient data estimating the supposed relative values of anthracite and bituminous coal! Such, indeed, was the difficulty of estimating the heating value of the gaseous products escaping by the chimney, that the learned Doctor thought it safest to throw them fairly overboard, and confine his comparative results to the mere quantity of "fixed carbon, or coke," which each contained. Yet we find, by Mr. Faber's results, that one of those gases alone, the carbonic oxide, (a gas which in ordinary furnaces, to a great extent, passes away unconsumed and invisible,) under proper management, and by a judicious introduction of air, in the very way I have suggested, *by small jets*, was equal to the production of an intensity of heat sufficient for the manufacture of iron.

Of the true calorific value of the escaping heat, under its various modifications, it is difficult to form an estimate, in the absence of a pyrometer of easy application; but a still greater difficulty presents itself as to the mode of turning this waste heat to the purposes of evaporation, when found to be in excess. On this head I hope to be able to suggest a practical remedy, and to this point I am directing particular attention.

It is curious and instructive to note how the eye, where proper means of observation are afforded, sets us right, by explaining and correcting many of the otherwise anomalous changes of temperature which the thermometers, in their respective situations, indicate, and *vice versa*. The thermometers, under certain circumstances, rising when, according to our received notions, they should have fallen, prove that some indicator of this kind was wanting; while the eye, that

infallible corrector of theoretic fallacies, proves how erroneous have been our notions, in many points connected with the source, and existence, and character, of visible flame. During the entire process I have been describing, from the beginning to the end of the change, we perceive no indications of any sudden action or effect: all proceeds with a regular ascending and descending progression, the whole being a succession of well-defined changes, completely under control, and exhibiting a beautiful and instructive series of causes and effects. Without those aids, however, which the eye and the thermometer afford, much would have been unintelligible, often apparently capricious, and even contradictory of what might have been predicated under the circumstances. It is by such means we are enabled to penetrate, as it were, the secret operations of nature, and correct our own erroneous notions and calculations. It is thus we may be said to be experimenting on the great scale, with all the accuracy and certainty of laboratory practice. By means of the eye, the chemist is enabled to detect the presence of what otherwise he could not have expected; and by that of the thermometers, to trace effects to causes, which, without such aid, would have been impossible.

In my next I will pursue the subject farther, and describe the several gases in the order in which they are developed, and enter into combustion, with the visible and thermometric changes which follow, and the relation they bear to each other.

I here take the opportunity of observing, that as my only object is to improve our practice by commemorating the facts which have come under my own observation, and showing their connexion with scientific details, and chemical analysis, according to the best authorities, I am quite indifferent to the charges with which I have been assailed, of broaching new theories, or new views of combustion. I have no such pretension, and aim at nothing but practical improvement, and not in the character of an amateur, but strictly within the province of my duties, and in furtherance of the interests of the company in which I am interested. I have sufficiently, in the Preface to my Treatise on Combustion, shown how in self-defence I had been driven to the necessity of examining for myself, and e[...] ing to find a way out of that [...] uncertainty, in which all st[...] sumers, steam-shipping compan[...] ticular, are involved, in all tha[...] the expenditure of fuel, and the [...] tion of furnaces and boilers. I[...] therefore, would here be misp[...] though the facts are interesting [...] point of view, as the subject is o[...] interest to the community.

One of my objects in bri[...] practical details of the subject t[...] the public, through the [...] columns of the *Mechanics'* [...] was in the hope of meeting u[...] ment, and exciting others to la[...] same field of practical improv[...] find it therefore inconvenient [...] tisfactory to discuss detache[...] of the subject with casual obj[...] more so, as objections are [...] raised, not with the view of [...] after truth, and aiding in the i[...] throwing additional light on t[...] but merely for the sake of [...] Where also such controversy [...] on, manifestly under perso[...] than scientific notions, it ca[...] nothing useful, and therefore [...] decline it; reasserting that as [...] is one of great interest, I s[...] times be glad to be set right wh[...] state chemical facts erroneousl[...] inaccurate inferences,

I am, Sir, yours, &c.,

C. W. [...]

Liverpool, March 14, 1841.

ON THE CAUSES OF FIRE—D[...] DISCARDED CONGREVE-MATC[...] CANDLES, ETC.

Sir,—Too much stress cann[...] upon the remark of Mr. Boo[...] in my last, (page 175,) "tha[...] tion to the published causes of [...] good will be accomplished;" a[...] wish to make a few observati[...] immense danger to which he h[...] ed, of a careless or thoughtl[...] congreve matches, now in such [...] employment for the productio[...] Many persons know by painful [...] the consequences of kindling o[...] matches immediately over, o[...] contiguity to a quantity; beyo[...]

ring thus occasioned, further ldom results, because the fire extinguished by the party oc- it. The great danger lies in ling of such matches as from come damp, or from some e do not ignite. To explain n, I will suppose the following number of workmen enter a shop on a raw damp morning er; one of the party, or a lad, rthwith to light a fire in a pro- r in a temporary structure of fford warmth to the workmen the glue-pot. The congreve e resorted to, but the moisture osphere has been attracted to sition; the first two or three 'miss fire," and are thrown ront of the grate, at length a otained and the fire kindled. time arrives, and one of the before quitting the shop, goes the fire is all right, or to put it may be to take off the glue- aving the fire he treads on one arded matches, which, by this ecome dry from the proximity , and inflames unperceived. ius kindled finds abundance of vicinity in the shape of dry havings, &c., and in less than f an hour after the workmen the shop, it is enveloped in d the origin of the fire is for ded in mystery.

rill suppose that the matches and unmolested till the even- or the following day. After rkmen have left, the master r a sober careful foreman the shops, and having seen all pproaches the fire-place to see that no lighted embers re- iginate a conflagration. Find- ight," he leaves, but on leav- on the fatal match, and ger- e very mischief he is so sedu- ding against. He has scarcely own adjoining dwelling, than f "fire" meets his ear, and at he finds how little his care l. the premises being *myste-* lamed from one end to the ittle does he suspect that he the incendiary!

Winstanley's shops were burned down irs since under somewhat similar cir-

I have put this as a suppositive case, but I have good reasons for believing that it has been, in more than one case, a reality.

I cannot help thinking that the "singular case of burning," narrated at page 176, originated from a similar cause. A smoker, perhaps, in lighting his much-loved weed, had dropped or discarded a congreve match, which lay on the pavement, in the sun's broad glare, until highly dried and heated; the poor little sufferer trod, with her half sliding step, on the dangerous composition, which inflamed with violence, and set fire to that portion of her apparel which was in close contact with it, and caused her melancholy end.

While speaking on the causes of fire, I cannot help adverting to the increasing number of accidents arising from the careless use of candles. Housekeepers would do well entirely to discard the use of open candles, when carried about, or when taken into bed-chambers and the like; if the expense of a neat glass lantern is too much, very safe wire-gauze lanterns are to be had at a very trifling cost, by which the ignition of bed or window curtains, and of apparel, may be prevented.

A most dangerous practice prevails amongst females, both young and old, but especially the former, of *placing lighted candles on the floor*, while kindling fires. Could the amount of personal suffering and the number of deaths produced by this practice be set forth, I think no master of a house or father of a family would allow such a course to be persisted in. The wearing apparel of the offender happening to come in contact with the candle, she is soon enveloped in flames, and such accidents as these generally happening before any other member of the family has risen, she perishes before any assistance can be rendered.

By the use of fire and candle guards, the published number of metropolitan fires, last year, might have been reduced in number nearly ONE-THIRD! While there is every reason to believe that the number of unpublished accidents of this kind, which might have been by such means averted, greatly exceeds the whole number of published fires, upwards of one hundred of them being attended with fatal consequences.

Under such circumstances, it is im-

possible to overrate the importance of attention to this subject.

I am, Sir, yours respectfully,

WM. BADDELEY.

29, Alfred-street, Islington, March 7, 1842.

MESSRS. PALMER AND PERKINS'S PATENT PUMP.

Sir,—In your Magazine, No. 967, there is a communication from Mr. Trebor Valentine commenting upon the explanation of Messrs. Palmer and Perkins's Patent Pump, contained in your No. 963. Patentees are always much obliged by the notice of their inventions by scientific gentlemen, and presuming that the remarks of Mr. Valentine proceed from a kindly, and not a controversial spirit, I have no difficulty in replying to him.

Mr. Valentine evidently bases his remarks more upon the drawing than the explanation of this invention, expressing his first doubt to arise from the drawing representing so short a *suction pipe*. Now it is perfectly understood, that drawings, intended to illustrate descriptions, are made more for that purpose than to provoke criticism. If the action of the pump in question is good, and it produces the requisite vacuum, the suction will follow as a matter of course, *notwithstanding the shortness of the pipe in the drawings;* and it was the object of the explanation to show that the action was such.

Mr. Valentine goes on to say, that the experiments already made do not justify the hopes entertained by the patentees of the utility of their invention for mining purposes. Perhaps not; but still, the description explains that two men worked a 10″ pump, raising a column of water 15′·4″ high. It is therefore an allowable inference, (while it was a conviction with the patentees,) that a greater motive power would have lifted a higher column. Probably Mr. Valentine may himself have been a patentee, and if so, he will have a fellow-feeling for the heavy preliminary expenses attendant on new inventions, and know how unavoidably they form a limit to the actual experiments which would justify every "*foregone conclusion.*" But, as touching both these points, I will, if he wishes it, introduce him to an establishment in London where there is a 7″ pump on this principle, which draws the water from a well 365 feet distant, the level of the water in the well being 17 feet below the clack valve; which height 23 feet of rising main, makes a tical lift of 40 feet. This pum going night and day, making and the piston travelling 32 minute, ever since the 4th of last, without requiring any atte tainly this fact supports the of the patentees, that their pum a valuable resource for mining

As to the other point, on Valentine appears to entertain viz., the reduction of friction, say, the experiments were anxiously conducted with a riving at the truth: the 10″ p which the experiments were are still standing at Mr. Cha son's, accessible to all the wor in fact, the best reference as parate or comparative merits.

I remain, Sir, your obedien

EDWARD W.

67, Mark-lane, February 28, 1842.

AMERICAN MARINE STEAM MAKING—THE KAMSCHAT FRIGATE.

Sir,—In Number 956 of yo I notice a description of the K steamer, together with obser flecting rather severely upon Jonathan's" attainments in gineering. The correctness o clusions in regard to the p engines and boilers of that s be questioned. That the fa rest with American *engineer* purpose to show, and I trus remarks will find a place in yo

I would beg leave, howev correct your statements in r the material used in the *Kamschatka*. The *frame* i *oak* throughout. The *plank* are entirely of *white oak*, (no elm," the use of which is her fastened with * bolts, compo and locust treenails. *Walls* o 5 inches thick, and not "sc frame." The frame is furt inside by diagonal braces of ir wide, 1 inch thick. So far as construction of the hull is c trust you will allow the bui for good workmanship.

The history of the build

* The writer has left a blank he rial of which the bolts are compose

:tka is a curious one, and forcibly the influence of *words* when into competition with the ordi- ifestations of practical good he story runs thus: The Rus- nment sent to this country two their navy, with the power to hrough the agency of an Ame- en, for the building of a steamer nd also to superintend its de- nd fitting out. These indivi- on their arrival here, became with a gentleman of the legal , who, it appears, was some- ested with the patentee of the engine, as it is termed, and me at once their nominal en- and contractor. The ship was and modelled under the direc- he Russian officers; and the nd quality of the timber used, ubmitted to their control.

signing of the machinery was he contractor, who brought to h engineering talent as could be in the by-ways of the profes- onstruction, from detailed draw- given to various establishments y.

I would ask, what have Ameri- eers to do with this? So far from approving the arrange- the *Kamschatka's* machinery, iture to assert, that there is not eer of intelligence to be found ountry, who will approve any s features, or who would not own it as an American produc- ite the fulsome adulations of the

he progress of steam navigation ountry, I do not mean to speak, its defence. The same eager- mprove the marine engine, by g its shape, at length evinced nglish and Scotch engineers, is d still more in the efforts of n engineers. On our part, ex- s have been conducted mainly iew to conform to that system, s obtained, in our river naviga- ., engines with cylinders small ter, and a corresponding decrease t of the working parts; in order hich, various expedients have orted to, but as yet, with no very ry results. The inference seems ining strength, that the present he English marine engine is the e in which steam power can be applied to the purpose of navigation; and when we shall succeed in adapting it to our favourite system of long stroke, with the means for obtaining the sudden admission and exhaustion of the steam, it will be generally adopted, so long at least as the common paddle-wheel is employed as the propelling agent.

F. W. S.

New York, February, 1842.

ARTIFICIAL FUEL A MODERN ANTIQUE.

Sir,—The public attention has been recently much drawn to the subject of artificial fuel, and in a historical memoir which I read last month of the various methods which have been patented for the purpose, the earliest is stated to have been one invented by a Mr. Peter Davey, May 20, 1800. Such of the readers of your valuable Magazine as may be curious respecting the history of this manufacture, may be gratified by being referred to a much earlier mention of it to be found in Hugh Platt's *Jewel House of Art and Nature*, first printed in the year 1594, a copy of which is preserved in Chetham's Library, in the college, Manchester. In this work it is recorded, that a Mr. Gosling, a merchant of London, was at the expense of printing handbills describing how a species of artificial fuel might be manufactured, and distributing them to the poor of every parish in London and its vicinity. The following is copied from his handbill. "Get," says Mr. Gosling, "a load of stiff loam or clay, and take half a peck of it, and with a shovel make it soft with water, then put a peck of small coal to it, and incorporate or mix them all together, until you may roll it or mould it into several parts, like pieces of charcoal or long eggs. As many may be made in a day as will last a quarter of a year. Any other combustible may be mixed up with it, such as peat turf, saw dust, curriers' or shoemakers' threads, tanners' waste bark, and such like." The worthy Mr Godfrey adds, in a note, that he dispersed freely many thousand of these handbills, "for the *good of all people in the land.*" He left it for the present generation to *secure* the same thing by patent.

I am, Sir, yours respectfully,

JOSEPH HENRY REDDELL.

Phœnix Chemical Works, Bow Common,
March 2, 1842.

MR. DAVIES'S ELLIPTOGRAPH.

Sir,—I am much pleased with Mr. Davies's ingenious instrument mentioned in No. 963, p. 73; but while contemplating it, I felt doubtful whether it would draw an ellipsis; and upon finding points in the curve which an instrument made and set *exactly* as represented at page 73 would draw, I found the curve too flat near the major axis, and I suspected it would be too much curved about the minor. I must explain that I supposed the upright stem to remain in every respect immovable, and the compass head to move *vertically*, as well as circularly upon it; and also, the guide *i* to have a knife edge, which I think will be found necessary, because its positions will coincide with radial lines from the centre of the stem *a*, and not with the radii of curvature of an ellipsis, such as *g* would appear if viewed in the direction of the stem.

I then submitted the matter to a mathematical friend, who, after investigation, declares that the instrument will only draw an ellipsis when the major axis of that ellipsis is in a certain fixed proportion to the diameter of the plate *g*, the proportion depending on the lengths, &c. of the other parts of the instrument. If this be correct, as I have no doubt it is, most likely some of your correspondents will furnish you with the investigation and proof; but I beg to say, I do not hold myself responsible for its correctness.

I mention these facts, because I think they indicate a peculiarity in the instrument which should be made known, and which has probably been overlooked, as it is described at page 74, as being perfect; they may be also useful in directing the construction. But, as it is possible Mr. Davies may fancy these remarks will injure the reputation of his instrument, which I have not the least doubt may be made more than sufficiently correct for its intended purpose, I shall feel obliged by your showing him this letter, that he may have an opportunity of publishing any observations he may wish to make upon it in the same Number in which it appears.

Your obedient servant,

S. Y. (An Engineer.)

February 3, 1842.

[In compliance with S. Y.'s request, we forwarded a copy of his letter to Mr. Davies, who wrote to us that a pressure of occupations would *him from sending his remarks* in time for contemporaneous publ He feels, however, "not the less to S. Y. for the courtesy of his nication."—Ed. M. M.]

STEAM-ENGINE IMPROVEMENTS BROW'S CONDENSING CYLIND GINE PRACTICALLY CONSID CORNISH AND MARINE STE GINES.

Sir,—The difficulties that surr inventor's path are sufficient to s damp the spirits of all but the m *fident and resolute*: yet these r qualities are apt to produce views of the circumstances in vour, unless regulated by a desi truth, such as has been evinced Pilbrow's reduction to a more m amount, of his estimate of the advantages due to the princip suggested plan for a stean Amongst these difficulties, that o ing a correct standard of com not the least. Unfortunately tentees, it is seldom sought for gence; yet its obvious necessi ciently justifies the course that adopted by Mr. Pilbrow, in mo question of the superiority of th made by Watt over those of re struction. I certainly deemed dence inconclusive, and the co inadmissible; but I never int impugn, in any way whatever, t racy of the experiments rep Farey, from short trials under able circumstances. I communi views of the trials under such c in compliance with Mr. Pilbr quest; but I avoided the prac of the question, whether thi would effect the object propos should I now again trespass pages, but for the expression on his part that I had done so.

I will, however, first advert apprehension, by Mr. Pilbrow meaning. I did not, as he suppo to the difference of temperatu condensing cylinder and the con a marine engine, but to the diff temperature between the steam and condensing cylinder of Mr. engine. I do not urge my

correct, but I am convinced
ërence of pressure will exist,
: contraction of the valves and
ssages, jointly with the differ-
emperature. The use of cold
nd the condenser, however dif-
practical application may be,
ır my views. In referring to
.bles, I find the pressure due to
ut $\frac{8}{10}$ lbs.; a much closer ap-
on, I must admit, to $\frac{3}{4}$ lbs. than
[assumed from imperfect re-

am for working Mr. P.'s condens-
er is only about $1\frac{1}{4}$ of the length
oke, and its ends work in an arc
15°; while the amount of devia-
the straight line is placed on
only. The framing and joints
apted for an engine intended to
ss, rather than a greater power
linder of a given size on the
d, further, the valves and steam
between the cylinders are ex-
ontracted.

observations apply in no respect
nciple of the engine, but to ar-
ts that may be readily altered,
rhaps not without some increase
t and space occupied. The
n with the beam marine engine
nt perfectly fair: how long the
l remain the standard is an-
stion; and on these important
weight and space the *Devasta-*
gines, by Maudslays and Field,
'irago's, by Boulton and Watt, will be awkward rivals. An inventor has to contend not only with the best engines of recent construction, but with all the improvements that may be effected in them; arising, perhaps, in some cases, from the very competition which his patent has excited.

I congratulate Mr. Pilbrow on the accession of a warm friend to his cause in "Scalpel," and on the latter's estimate of the value of the invention. The novelty and ingenuity of it I have always been ready to acknowledge, though perhaps the doubts I have expressed respecting the extent to which it is available, (a point on which all now seem to agree,) may not be considered such an indirect compliment as to bear that interpretation.

I shall be glad if my good wishes could give him a fair field and no favour, with plenty of time, and means to use it; and I trust the objection I have made to the arrangements shown in the drawing will be taken in good part, as not intended to injure the patent, but to call attention to the best means of insuring success.

So much has been said respecting Cornish engines, and their expansive action, &c., that I deem a comparative statement of the steam and water conditions used in them and their rivals in size and their superiors in power, the larger marine engines, if not of utility, may perhaps be of interest to some of your readers, many of whom are perhaps not accustomed to see the results of expansive action exhibited in the following form.

rative Statement of the Performances of Cornish and Marine Steam-engines.

	Cylinder in inches diameter.	Stroke in feet.	Cubic feet in cylinder.	Steam cut off at	Cubic ft. of steam including clearance.	Stroke per minute.	Steam in cubic feet per minute.	Steam admitted into cylinder in lbs.	Mean steam in lbs. per square inch.	Volume from 1 of water.	Water in cubic feet per minute.
'	$72\frac{1}{2}$	7	200	$\frac{2}{3}$	140	60	8400	16	15	1700	5·
e	80	10	350	$\frac{1}{6}$	60	6	360	35	$16\frac{1}{2}$	730	·5

	Area of cylinder in square inches.	Feet of motion per minute.	Mean steam pressure in lbs.	Steam in lbs. one foot high.	Steam in horse power.
. Western......	4128	× 420	× 15	= 26,320,500	800
sh Engine ...	5026	× 60	× 16·5	= 4,975,740	150

Now, taking the ton of coals at 24 bushels, 26 tons = 864 bushels, and

$$\overset{\text{men}}{5} \times \overset{\text{bush. per day}}{1440} = \frac{7200}{864} = 10\tfrac{1}{4} \text{ cubic feet of}$$

$$\text{water per bushel; } \overset{\text{men}}{\cdot 5} \times \overset{\text{bush. per day}}{1440} = \frac{720}{10\tfrac{1}{4}}$$

= 68¼ bushels, or less than 3 tons of coals per day. The work done by the boilers of the *Great Western*, in the evaporation of water, is just 10 to 1; but the effect of the steam on the piston is only as 5¼ to 1. The quantity of water consumed at each stroke of the cylinder is not quite exactly the same in both engines, as ·5 has been substituted for ·486 of a cubic foot per minute, in the Cornish engine.

$$\left.\begin{array}{l} 5 \ \div 60 = \cdot 0833 \\ \cdot 5 \div \ 6 = \cdot 0833 \end{array}\right\} \times \overset{\text{lbs.}}{62\cdot 5} = 7 \text{ lbs. of water per stroke.}$$

The conditions were approximately taken from practice, without reference to this point, and the circumstance was not noticed at first.

The value of the cylinder vacuum, and also the value of the friction air-pump power absorbed, must be estimated, to obtain the net horse power, according to each person's views; and it is as easily managed with the total steam pressure expressed as horse power, as with the pressure in lbs. per square inch. Taking the condenser at ¾ lbs., and the mean difference between it and the cylinder at 1¾ lbs. we shall have 2½ lbs. resistance on the under side of the pistons of the *Great Western's* engines, and consequently ⅙th part of 800 horses power, or 133 horses power resistance against the piston. The allowance is less in the Cornish engine, on account of the pause between the strokes. The friction allowances must be made at pleasure. I conceive the mean power in crossing the Atlantic will not reach 600 horses power.

I remain your obedient servant,

S.

ON THE CAUSE OF EXPLOSION IN STEAM-BOILERS, AND THE REMEDY. BY MR. WILLIAM SAMUEL HENSON.

[We have in a former Number (493,) described an improved mode of working steam expansively, which forms the most important of "Certain Improvements in the Steam-engine," lately patented by Mr. Henson. Another of Mr. H.'s improvements consists in the application of a governor to the safety-valve of steam-engine boilers, by which the safety-valve is raised when the engine is at rest, and the danger of explosion from the sudden stoppage of ebullition in the boiler thereby prevented. The present paper explains Mr. H.'s views in this improvement; they are ingenious, shrewd, and original, and well deserving of attention. —Ed. *M. M.*]

I find by the Government Report on steam-vessel accidents, published in 1839, that, out of twenty-three explosions, nineteen occurred whilst the vessels were on the instant of starting, or were stationary; three whilst steaming; and the time when the remaining one took place was not ascertained. In two instances only was it *proved that steam was* blowing through the safety-valves at the time of the explosion, showing the valves to have had an insufficient area, being only from one-fourth to one-fifth of a square inch to each horse power, instead of one square inch, as recommended by the most eminent engineers. In the other seventeen cases of the nineteen, the ebullition had not been continued in the boilers while the engines stopped.

The greatest number of boilers have ruptured below the water-line, caused apparently by some sudden action under water. The most violent explosions have generally taken place just at the instant of setting the engines in motion after standing quiet some time with no steam escaping, and consequently no ebullition. These explosions have generally been attributed to the lowness of the water in the boiler, and the exposed parts getting red hot, whereby, when the water is agitated by the engine being set on, or by the safety-valve being suddenly opened, or even by the oscillating of the vessel, a thin sheet of water has washed over the

s, causing, as suggested, the
ation of such an immense vo-
m, that no safety-valves could
ooiler in time to save it. But
had been continued when the
ped, this cause of explosion
ave arisen, as the ebullition
probably have prevented the
g red hot, at least those parts
ater. The water has been
et very low while the engines
k, without any accident hap-
: the same boilers have ex-
st the engines were stopping,
reason to suppose there was
ater, and the safety-valves not
In several instances it has
d that a sufficiency of water
the boilers at the time of the
and the vessels have performed
ular voyages across seas which
d seaworthy vessels and strong
these boilers have exploded
aring to start, or on the instant
from the quays or ports where
been stopping, and weakness
iency of stays has been attri-
e cause.
rsons have contended that the
olence of some explosions is
the over-heated parts of the
mposing the steam and gene-
hly explosive mixture of gases.
at red-hot iron will decompose
in doing this the oxygen com-
the iron, and the hydrogen
free, which is not explosive
n no instance, I believe, have
es been proved to be produced
e circumstances.
rious incidents I have been led
that there may be another
xplosion which has hitherto
servation. I will endeavour to
s briefly as possible. It is well
t water boils, under the ordi-
are of the atmosphere, at 212°
that it takes about five times as
vert a given quantity of water
at 212° as it does to raise the
n the ordinary temperature to
g point. It follows that this
ains about five times the quan-
ric to its equivalent in water,
r words, that the steam contains
as much heat as it contained
e state of water at 212°; but
nal heat is not sensible to the
r, because it is expanded throughout a greater space. Therefore, as every particle of water requires a much higher temperature than 212° before it can expand into steam, it appears that if heat could be communicated equally to every particle of water, and the water kept perfectly still at the same time, the water would attain a much higher temperature than 212° Fahr. before the whole of it flashed into steam. This I am aware is not easy to accomplish, on account of water at rest not being so good a conductor of heat as when in motion; and those parts which are hottest, being lighter than the other parts, will rise to the surface and disturb the stillness. This tendency of the most heated parts to rise to the surface causes a number of currents to move in various directions, and these currents appear to assist materially in the formation of steam, by enabling certain portions of water to concentrate sufficient heat in themselves, from the surrounding portions, to form steam.

I have found by experiment that water kept very still, and heat communicated gradually, it did not boil, although considerably above the boiling point; but upon agitating the water a little, even when the fire was removed, a portion of it instantly flashed into steam, driving some of the water with considerable violence against the upper side of the vessel, and a very brisk ebullition continued for a space of about a minute afterwards, until the temperature of the water was reduced to the boiling point. This experiment was tried at a low temperature, with a close vessel, from which the atmospheric air was excluded. The upper part of the vessel was kept at a low temperature (about 60° Fahr.) and the lower part heated very gradually by interposing dry sand between the fire and the vessel. I have by this means heated the water something more than 100°Fahr. above the boiling point. As it is very probable that the effect above described is produced equally at high temperatures, I think its violence is quite sufficient to account for some of the phenomena of steam-boiler explosions. Again, if a bottle containing a little cold water, or almost any other liquid, be corked lightly, and then shaken well, there will be sufficient vapour formed by the agitation of the water, and the escape of the gases contained therein, to blow out the cork. But to produce a still greater effect, put

Q 2

a little water into a deep bottle and cork it up, leaving a small aperture open to the atmosphere, and then boil the water by means of a spirit-lamp; when the steam has heated the whole of the bottle, and escapes freely from the aperture, remove the bottle from the lamp; and when the steam has ceased to blow out, and the ebullition stopped, turn the bottle on one side, or give it a good shake, when a considerable volume of steam will instantly be generated, which will blow out the cork. This experiment shows the necessity of having a large surface of water for the steam to escape from in a steam-boiler, and the danger of allowing the water to remain quiet. I will also observe, that with a sufficiency of water in a boiler, and good safety valves, not overloaded, there is less danger with a brisk fire than with a slow one, as the former would continue the ebullition while the engine was stopping, by generating sufficient steam to force open the safety valves, thereby preventing the formation of great quantities of steam.

The sudden commencement of ebullition has also a tendency to strain parts of a boiler by the contraction of the iron arising from the cooling effect peculiar to evaporation at all temperatures. The well-known experiment of taking a vessel containing water boiling hard from the fire, and resting it upon the hand without pain, though it cannot be borne for a moment after the ebullition has quite ceased, is sufficient to prove this fact. The Americans appear to be well aware of the danger to their steam-engine boilers of stopping, without knowing whence the danger arises; but by disconnecting the paddle-wheels from the engine, they are enabled to stop the vessel without stopping the engine, though in this case a fly-wheel is necessary, or the engine would not work at all. But it is not requisite to continue the engine at work if a certain quantity of steam be allowed to escape; the effect in the boiler will be exactly the same as if the engine was at work, and water may be very readily supplied to the boiler without the assistance of the engine.

It is generally believed that explosions have taken place when there has been a sufficiency of water in the boilers at the moment of opening the safety valves suddenly, or of setting the engines in motion. I have already shown what may be the effects of the slow communication of caloric to the particles of water. I will now point out how the conditions necessary for that purpose are fulfilled in the generality of steam-boat boilers. The flues which contain the fire-grate, and conduct the heated air through the body of water, pass longitudinally through the boiler. The greater part of the heat is absorbed by the water on the top and sides of these flues, but still a considerable portion is absorbed by the lower side. When the engine is at rest, and no ebullition going on, that portion of water situated just under the flue, in consequence of being heated on the upper surface, absorbs the heat very gradually, without causing motion amongst its particles, because those portions on the upper side nearest the bottom being lighter on account of being hotter than the portions immediately underneath, have no tendency to cause those currents in the water which appear to assist so much in causing ebullition. Thus that portion of water directly under the flue becomes heated very considerably above the boiling point, and when any thing occurs, as the starting of the engine, &c., to cause agitation or vibration, a great body of steam is instantly formed, which impinges against the under side of the flue, and the bottom of the boiler. The water is by this means driven for a moment against the top of the boiler, choking up the safety-valves, and by the great agitation into which it is suddenly thrown, causing every part to give out an additional quantity of steam, whereby the under side of the flue, if not very strong, will probably be collapsed; and it is a fact that in most cases of collapse the flues have ruptured on the under side. The violent force with which the greater part of the water may be thrown against the upper surface of the boiler by this means, may account in some measure for the singular but well-known phenomenon of an entire boiler being lifted from its seat, and the great additional volume of steam which is given out by boiling water when violently agitated, may explain the fact of its bursting in the air.

From these experiments and investigations I have been led to form the opinion that if the ebullition in a boiler can be constantly kept up, explosion is not likely to happen; and to continue the ebullition, therefore, while an engine is

have introduced the improve- described, into the boilers of es.

ıs OF FOREIGN SCIENCE.

ntinuation from page 203.]

evolved in Blast Furnaces.

'th of January last, M. Ebel- memoir to the Academy on of employing usefully the off by iron furnaces when in the constitution of these gases. ical reader is probably aware l while ago M. Bunsen, of whose laborious, dangerous, ıl researches on alkarsin and ıds, have made his name onducted also a long course nts upon the gases evolved in s.

ts both of his, and of Ebel- ches, though of considerable erest, do not seem to have h additional light upon the of iron. The value of the plications of the combustible off, as proposed by the latter, proved.

emical properties of Gold.

erel has commenced reading my of Sciences of Paris, the ries of memoirs on "The nical properties of the simple on their applications in the first memoir is On Gold—it ngth, and treats minutely of e most important operations urgy of this metal, methods &c. When this series of ll be complete, a translation a cheap form would be a addition to our scientific

ew French Telegraph 'M. Vilallougue.

e age of telegraphs and tele- We have electric telegraphs g our top-coats when left e railways; and semaphores, e cream of the news as it the Atlantic by steam; and rst of our news from India, d or bad, across France by

ng telegraphs in France con- arms, moveable in the same ; *the principal arm*, called "the regulator," carries at each end a smaller arm, called "an indicator." The regulator, moving on an axis in the middle of its length, is either horizontal, vertical, or at 45° of inclination; each indicator turning on its extremity, is perpendicular, or at 45° to the regulator, and never takes six positions with reference to the latter. Recently in some of the government telegraphs, the regulator has been fixed horizontally, and the place of its four positions supplied by a separate bar, placed above, and moving like the beam of a balance; this upper bar the French call "*mobile*," for which it is not easy to find an English word.

M. Vilallougue's telegraph adopts the same principles of notation as this latter, but his mechanical arrangement is such as gives greater facility in working the machine, greater clearness in hazy weather, &c.; and enables the same instrument to answer as a day and night telegraph, with only the loss of two minutes time to change it from one to the other.

His telegraph tower is square, and painted black externally. On one of its faces it carries three large dials, like clock dials without figures, made of wood, or sheet iron, and moveable in a vertical plane round their respective centres. Each of these is about 9 feet in diameter. The two lower ones are placed side by side on the same level; the third is placed centrally and above them.

Below the two lower dials a bar of wood, painted white, is placed, behind which is an aperture of the same size into the interior of the tower. This bar is horizontal, and represents the fixed regulator of the present system. Each of the two lower dials has got a radius wide. The upper dial has got a diameter, painted white, upon it, of two decimetres painted white, upon it. Means are provided inside the tower for turning these dials on their centres in any way required, and by the respective positions of the diameter, with the two radii and the regulating bar, the signals are conveyed.

The opposite side of the tower carries a precisely similar set of dials, &c., whose axes are the same (*i. e.* on the same shafts) as the former, so that the signals are made on two faces at once; thus the watchman at the former, or last station, always sees what signals are making by the next telegraph to him to that beyond, by which he knows if his own signals

have been correctly seen and observed. So much for the day telegraph, which, in experiments made at Perpignan, was distinctly seen with telescopes magnifying from thirty to forty times, at 8000 metres distance, which is about the mean telegraphic distance. To convert this into a night telegraph, the white bars on the several dials, and the regulator bar, are movable, and in their place, when removed, is formed a band of a built lens, that is to say, a strip cut out of one of Fresnel's lenses, (the polyzonal lenses of Brewster,) by two planes, parallel and equidistant, from a diameter. The breadth of this *slice of lens* being equal to that of the white strip or band before spoken of, the interior of the tower is strongly illuminated by lamps like a lighthouse, or single attached lamps are placed in the focus of each band of lens, and the whole is now in a condition to work as a night telegraph.

The acknowledged difficulties of night telegraphs are thus much reduced, if not got rid of; and the whole instrument is worked free from the inconvenience of weather, &c.

It has also been found advantageous to substitute for the band of lens two simple glazed apertures at each end of the diameter in the upper dial, and at the extremities of the radii of the lower ones, and of the regulator. There appear to be several not inconsiderable advantages secured by this arrangement, which has been approved of by the Academy of Sciences, after having been reported on by a commission of its members.

New Method of Purifying Gas.

M. Mallet has had in operation for some time, at the gas-works at St. Quentin, a new method of purifying gas, which was described to the Academy of Sciences in August last. The results are said to give a gas of the highest purity, free from naphthaline, which is what makes the chief part of the smoke that blackens our ceilings, in our own gas from coal; and equally free from various ammoniacal compounds, which give much of the detestable smell to coal gas when it escapes. The gas at St. Quentin, though candidly admitted by the inventor of this process of purification not to be absolutely without smell, has yet very little, and that scarcely, if at all, offensive. It would be very desirable if our own Gas Companies would adopt something of this sort.

Photography.

M. Nothomb has addressed the Academy of Sciences, statin has found it advantageous to proto-chloride of mercury in running mercury, (quicksilver,) posed by Daguerre. The proto is the calomel of the Pharmaco

Dilatation of Elastic Flu

Most persons are aware, wl the course of science, that the of dilatation of elastic fluids, w a comparatively recent period assumed the same for every gas, that the dilatation was $\frac{1}{480}$ pe volume for each degree of Fa thermometer, has more rece submitted to new researches nault, Desprets, and others. M is the latest experimenter in and has not yet concluded his r which are of great value: he ever, already ascertained that ficient of dilatation is not pre same for all gases, and that the does not arise from the easy con of some, such as sulphurous liquids.

Nicotia.

The vegetable alkali of to been carefully prepared and with experiments of controul b ral: it is a colourless anhyd which does not freeze at 10° ce a burning taste, and is volati cent., and is a violent poison drop placed on the tongue of sized dog poisoned him in thre It reacts alkaline. Its com $C_{20}\ H_{16}\ Az_2$.

Coal in France.

The coal formation of the b Soane and Loire has lately bee in a memoir by M. Burat, w considerable interest. The c formation is different from any as to its mode of deposition regularly in beds, but rathe masses, which surpass in th depth any thing previously kno of no great horizontal extent. places the coal is confounde other matters of the formation

Artesian Well of Gre

The public excitement in the formidable consequences result to the city from the we nelle, unless speedily filled up

-en produced by the absurd state-put forward with an air of science thority by the public newspapers, rived at such a pitch, that the Aca- of Sciences has deemed it requisite ice it, and formally to refute the aper statements. It is a singular of society in France, and in Paris icular, and is a theme for the po- and psychologist, that this people eminent for physical science, and too, for the absence of religion— readily and so frequently put into panics about expected or predict- gers, either in the heavens above earth beneath them. Thus, a few go, Arago had to reassure them, formal essay in the Annuaire, to that Encke's comet would *not* the earth, and either burn or them; and now the Academy has forward to assure them that Paris ot be swallowed up in the immense hich the well at Grenelle will, they wash out under the city.

The Daguerreotype.

Bisson has found that, by placing cup which contains the mercury, e Daguerreotype process,) a little lic solution of iodine, the mercury e iodine evaporate together, and o the as yet invisible image, when ed, a tint much more agreeable easing for portraits than those at t obtained, which certainly are adaverous-looking things.

STATE OF THE IRON TRADE.

(From the *Mining Journal.*)

are enabled this week to furnish a ta- tatement, showing the number of fur- n and out of blast in the United King- with the weekly "make," in most es taken from data on which no ques- n arise as to the accuracy of the re- while, in other cases, we have adopted timates as appeared to us, from the ation derived, to be sufficiently near attainment of the object in view— presenting to our readers a complete wherein the several iron works of the Kingdom are classified, and the product, as also the aggregate re-

following summary will at once ex- e present position of the iron trade:

	Fur-naces.	In blast.	Aver. weekly make.
South Staffordsh., 1st div.	87	54	4200
„ 2d div.	48	32	2475
North Staffordshire	18	12	620
Shropshire	36	24	1355
Derbyshire	15	14	577
Yorkshire	30	24	1059
Scotland	91	65	5525
Northumberland........	7	2	120
Durham	2	2	120
Forest of Dean	8	3	120
South Wales	162	112	9000
North Wales	21	6	360
Ireland	2	—	—
Total	527	350	25531

It will be thus seen, that the number of furnaces in the United Kingdom is 527, of which 350 are in blast, and 177 out of blast, the quantity of pig-iron made, or capable of being made, at the present time, (by the furnaces in blast,) being 1,327,612 tons per annum, from which, however, we may deduct 20 per cent.—leaving 1,062,090 tons as the actual make. On comparing this statement with an abstract of the quantity of pig-iron estimated to have been manufactured in the year 1839, and which is embodied in Mr. David Mushet's work, entitled "Papers on Iron and Steel," we find the average weekly make at that period to have been as follows:—

	Fur-naces.	In blast.	Aver. weekly make.
South Staffordshire	126	106	6660
North Staffordshire	10	7	350
Shropshire	34	29	1555
Derbyshire	16	14	660
Yorkshire	29	24	1010
Newcastle-on-Tyne	5	5	250
Scotland	54	54	3790
Forest of Dean	8	5	350
South Wales	127	122	8730
North Wales	20	13	650
Total	429	379	24005

Or an annual "make" of 1,248,260, which is called in Mr. Mushet's work 1,248,781 tons. It will be thus seen that, comparing the present make with that of the average of 1839, the number of furnaces in that year was 429, of which 379 were in blast; whereas, in February, 1842, the number had increased to 527, of which only 350 were in work, the majority being at a reduced make of 25 per cent.—the aggregate quantity made weekly being, in 1839, 24,005 tons, and in February, 1842, 25,531 tons—there being an increase, in the past two years, of 98 furnaces, equal to an additional make of 407,680 tons per

annum, (about one-third the average make,) while the number of furnaces in blast in 1839 was greater than those enumerated as being in operation at the present time.

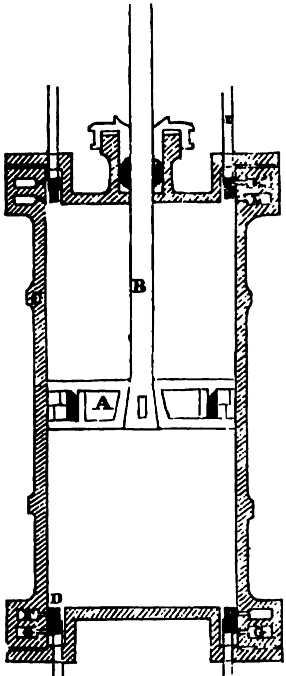
IMPROVEMENT IN SLIDE VALVES.

Sir,—I beg leave to inclose some sketches of a slide valve, which to me appears to be of a new construction, and to offer considerable advantages over those in ordinary use.

Fig. 1 is the section of cylinder valve, piston, &c. A represents the piston; B, the piston rod; C, the cylinder; D, *slide; E, valve spindles*; F, bottom steam passage around the cylinder; G, bottom exhausting passage; K, top exhausting passage; L, top steam passage.

Fig. 2, H is intended to represent a section through the ports, and steam-passage, &c.; I, is steam port; J, the exhausting port.

Fig. 1.



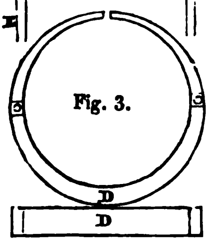


Fig. 3.

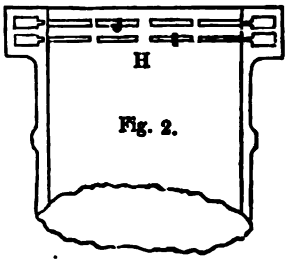
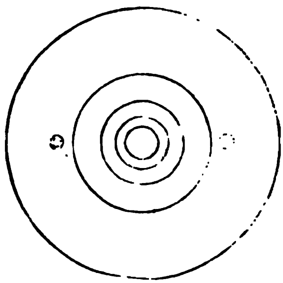


Fig. 2.

Fig. 4.



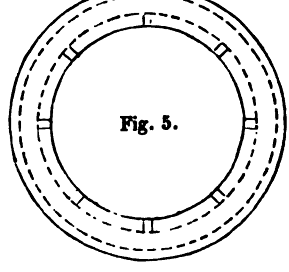


Fig. 5.

Fig. 3, D represents the valve, being a round ring.

Fig. 4, is the top view of cylinder cover.

Fig. 5, is top view of cylinder through the ports, showing the ribs.

The utility of this valve, consists in giving steam much quicker, in conse-

of the ports being all round the ·, and the valve travelling there- out $\frac{1}{16}$th part the distance of the a D slide valve. It does away h a deal of work, such as the D alve jacket, packing blocks, &c. am may be also, by this means, expansively to a greater ad- than at present, as it is neces- have an additional expansion r the present D valve, when it is to work steam expansively.

I am, &c.

THOMAS MERITON.

all, January 27, 1842.

W. WILLIAMS'S PATENT FURNACES SSRS. DIRCKS AND CO., AND MR. RONG.

Our attention has been called to a om Mr. R. Armstrong in your of the 5th March, in which a slight pted to be thrown on us, merely in nce of our acting as principal agents rgand furnace of Charles W. Wil- sq.

e quite satisfied in our own minds nprejudiced party can read the com- on alluded to, without being con- at all sober argument or scientific s at an end with an individual who nd to the style of that letter. Such pression, and much as we feel dis- make a few remarks on the un- d assertions of Mr. A., we shall om so doing, not only from enter- his opinion—of itself sufficiently but also for the following, if possi- cogent reason. We decline enter- sts with Mr. Armstrong, he having e last fortnight declared, in the language, the most implacable hos- ards Mr. Williams, and a determi- attack him, and whatever emanates , by every means in his power. We coolly and advisedly, and are pre- support the assertion.

ot, therefore, from our being unable vert Mr. A.'s statements, but from keep free from his personal abuse, ntest in which none but an inter- rty can feel any concern, that we aking further notice of the letter in

We are, Sir,

Yours, &c.,

DIRCKS AND CO.

ster, March 1842.

VARIATION OF THE NEEDLE—GREENWICH MAGNETIC OBSERVATORY.

The needle is known to have had a westerly variation ever since about 1657. The late Colonel Beaufoy, who made a long series of very skilful and accurate observations on the subject at Bushy Heath, about ten miles N.W. of London, considered that he had ascertained that in March, 1819, this variation had attained its maximum, being then 24° 41′ 42″ W., and that it had begun then to decrease at an annual rate of 1′ 37″. A writer in the Quarterly Review makes the retrocession contemporaneous with the great breaking up of the Polar ice in 1816 (three years earlier than the date assigned by Colonel Beaufoy), but not on any sufficient authority. In 1839 a Magnetic Observatory was added to our national Greenwich establishment, and the observations which have been since made there, under the superintendence of the Astronomer Royal, Professor Airy, confirm the general correctness of Colonel Beaufoy's conclusions, though they indicate the annual decrease to be greater than he supposed. The results obtained for the last two years are as follow :—

1840	23° 23′ 30″ W.
1841	23° 17′ 40″ W.

The Magnetic Observatory at Greenwich is erected on a piece of ground adjoining Flamstead House. The following description of it is given by the author of an interesting article, "On Telluric Magnetism" in the *United Service Magazine* for March last :—"It is entirely built of wood, and completely insulated. The free magnet is a bar of hard steel, 2 feet long, 1½ inch broad, and ¼ inch thick, suspended by a skein of silk fibre from two pulleys fitted to a suspension frame about 9 feet above it. Before the magnet there slide two small brass frames, firmly fixed in their places by means of pinching screws. One of these contains, between two plane glasses, a cross of delicate cobwebs; the other holds a lens of 13 inches' focal length, and nearly 2 inches' aperture, which combination serves as a collimator without a tube, and perfects the adjustment."

THE ATMOSPHERIC RAILWAY.

Opinions of Professor Barlow and Col. Sir Frederick Smith, R. E.

A Report has been laid before Parliament, which was made to the Board of Trade on the 15th of February last, by Professor Barlow and Sir Frederick Smith, on the merits of the atmospheric system of railway, invented

and patented by Mr. Clegg, and fully described in our 882nd Number. The opinion of these two highly competent authorities is decidedly favourable to the adoption of the system. They sum up their Report by declaring—

"1. That we consider the principle of atmospheric propulsion to be established, and that the economy of working increases with the length and diameter of the tube.

"2. That the expense of the formation of the line in cuttings, embankments, bridges, tunnels, and rails, will be very little less than for equal lengths of a railway to be worked by locomotive engines; but that the total cost of the works will be much greater, owing to the expense of providing and laying the atmospheric tube, and erecting the stationary engines.

"3. That the expense of working a line on this principle, on which trains are frequently passing, will be less than working by locomotive engines, and that the saving thus effected will, in some cases, more than compensate for the additional outlay; but it will be the reverse on lines of unfrequent trains. However, there are many items of expense of which we have no knowledge, and can form no opinion, such as the wear and tear of pistons, valves, &c.; and on these further experience is needed.

"4. That with proper means of disengaging the train from the piston in cases of emergency, we consider this principle, as regards safety, equal to that appertaining to rope machinery. There appear, however, some practical difficulties in regard to junctions, crossings, sidings, and stoppages at road stations, which may make this system of less general application."

NEW STEAM-ENGINE ERECTED BY MESSRS. RENNIE, AT MR. CUBITT'S FACTORY, THAMES-BANK.

The two cylinder expansive engine invented by Hornblower, and afterwards, with but slight modifications, brought into extensive use by Woolf, is well known to all persons acquainted with the history of the steam-engine. The cause, also, of its subsequently falling into disuse is no secret; it was found to perform no more duty with two cylinders than could be done at much less cost with one. Not that more duty was *previously* done with one cylinder, but that in the progress of improvement it was discovered, or supposed to be discovered, that steam could be worked expansively as well with one cylinder as with two; and so the cost of the second cylinder, and the extra friction and radiation attending the use of it saved. Abandoned in Cornwall, where it first found favour, and long maintained a strong hold on public opinion, it has now, strange to say, been reproduced in the metropolis by engineers of the first eminence; and, stranger still, with a degree of success which, if there be no mistake in the case, shows not only that it has been most undeservedly shelved by its Cornish patrons, but that it is in truth the best sort of engine which has ever yet been constructed.

The engine which has thus taken the engineering world by surprise is one which has just been erected by the Messrs. Rennie, at the extensive manufactory of Mr. Thomas Cubitt, Thames-bank. It differs in no respect, as far as regards details and arrangement, from the ordinary rotative engine of Woolf; nor is any such difference claimed credit for by the makers. There are the two cylinders, side by side, as of old—a small one, into which the steam first passes at a high pressure from the boiler, and a larger one, into which it expands (five times); also the ponderous beam, fly-wheel, rotating shaft, &c. The only difference we could observe consists in the workmanship, which is of a very superior description, and in a little better clothing (perhaps) of the cylinders. The effective working power is stated to be equal to 60 horses, and the consumption of fuel to be *no more than 2·2 lbs. per horse power per hour*. It is this which is the startling result. So small an expenditure of fuel has never been before reached by any rotative engine, of any description; not even by the same sort of engine, when in the friendly and fostering hands of Woolf. That it has been actually realized in the present instance by virtue merely of better workmanship and better clothing, no person can be expected to believe, except on the most indisputable evidence; and such evidence the respectable manufacturers of the engine will, no doubt, themselves allow still remains to be furnished. We were assured that it was doing the same work which two or three old engines, of the cumulative power of 60 horses, had been in use to perform, and have no reason to question the fact; but that, evidently, is a very uncertain test of its real power. We were also shown indicator diagrams, which exhibited a very small average deficiency of pressure; but the insides of steam cylinders and working shafts, as all the world knows, often tell very different tales. The means taken to keep a correct account of the quantity of fuel consumed, (Welsh coal,) appeared to be also most unexceptionable; and if we could only admit 60 to be the proper divisor to employ, we make no doubt of 2·2 lbs. per horse power per hour being a true result.

wever, of the 60 horses' power is ing—such direct and positive proof *performance* alone can supply, and luring short trials of an hour or a time, but during trials carried on l days successively, and under the cumstances, precisely, in all re-

TS OF SPECIFICATIONS OF ENGLISH 'ENTS RECENTLY ENROLLED.

BERRY, OF CHANCERY-LANE, GINEER, *for certain improvements eans and apparatus for obtaining ower, and rendering more effective known agents of motion.* (A comm.) Rolls Chapel Office, February

improvements, like all the other orking contrivances of this class, to obtain power, set all the estab- rs of matter and of motion at de- If any reliance at all is to be placed statements which compose this us specification, the patentee has d the long sought-for "perpetual ' but he does not seem to be aware t.

nprovements are said to relate to eans and apparatus intended for ction of motive power, and consist y in the employment of water, luid, such as air, which is intro- an agent between the prime mover s upon it, and the object against force or power ought to act, and of the novel arrangement of parts, pplication of motive power is ob-

zontal circular plate, or wheel of d, stone, or other suitable material, d near its outer edge, with a groove l, in which is laid a flexible tube; ntervals, the horizontal plate is per- ith holes, through which, supply- rnished with valves opening up- led into the flexible pipe before l. The water, or other fluid being nder pressure, rushes into and fills le pipe, which is to be very strong double, of leather, or other water- ic. A heavy vertical wheel travels horizontal plate immediately over e pipe, pressing before it the water in the pipe, which is forced through ipe, and is lead to some suitable y to which it gives motion. In the on, a revolving spiral wheel, on the of Barker's mill is recommended— *and Stirrats' is no doubt* intended. *r to communicate* the requisite pressure, the following novel expedient is resorted to by the patentee; "to the axle around which the weight-wheel revolves, a double steel-yard is adapted, and at the end of the steel-yards, or levers, are suspended certain weights, *which by their distance from the point of support multiply the weight!* So, that if the wheel be required to press with an effective weight of 8,000 lbs., and the wheel and its appurtenances weigh but 2,000 lbs., a weight of 1,000 lbs. is to be attached to the extremity of each of the two levers: we shall then have for a weight of 2,000 lbs. an effective weight of 6,000 lbs., if the levers from the centres to their extremities are three times the length of the radius of the wheel!!

The advantages of this system are said to be that the application of the power which is obtained by it, allows such power, whatever it may be, to be multiplied *ad infinitum*, as it has been ascertained, that in order to propel a weight-wheel of 3,000 lbs. weight, (supposing the resistance that the water in the flexible tube offers to its progress is equal to that which motive power encounters on paved roads,) it will be necessary to expend 75 lbs. of power. Therefore, for 75 lbs. of power expended in propelling the weight-wheel, a disposable power of 3,000 lbs. weight will be obtained by the water at the end of the exit-pipe: which water acting, for example, upon a spiral revolving wheel, will allow the latter to propel one or more wheels of 120,000 lbs. weight, which wheels acting on one or more flexible pipes, will generate power by consecutive series *ad infinitum!!!*

The Barker's mill is set forth as an example, being considered to give out the greatest useful effect, but any other form of machinery may be employed in lieu thereof; or the issuing column of water may be projected in a jet for extinguishing fires, or for other hydraulic purposes.

For pumps, or fire-engines, the apparatus is to be placed under ground, near the building to be protected.

The apparatus is next shown as applied to the propelling of vessels. In one case, the weight-wheel revolves round a circular plate as before mentioned; in another, it traverses backward and forward, expelling the water alternately from the bow and the stern.

Another form of apparatus is then described; it consists of the cylinder of a steam-engine, which, instead of acting upon a crank to produce rotary motion, acts by means of its piston-rod upon another piston in a second water cylinder, the water being forced through a Barker's mill, or other rotary machine, *a little soap being added to the water to reduce the friction!*

By this means, says the patentee, a more

uniform rotary motion may be obtained, the dead points avoided, and also the necessity for great speed in the steam-piston avoided. A modification of the slide-valves supposed to be necessary for this purpose is described at length.

The application of a similar apparatus for propelling vehicles of various kinds is described, but no particular scale is given for the construction of the apparatus, as the proportions and dimensions may be varied. The patentee merely advises that the running wheels should be made much larger than they are at present, (query, how much larger than 7 feet?) and that the steam piston should exceed in size that of the water cylinder.

The construction of a locomotive engine on the principle of the traversing weight-wheel is next set forth, but it is said to be inapplicable to rapid motion; it is, however, admirably adapted for carts, wagons, ploughs, &c. To ploughs so propelled, the patentee proposes to prefix a horse or bullock for the purpose of turning them round at the end of the furrow!

The claim is, 1. To the employment of a weight-wheel revolving and pressing upon a flexible pipe, or chamber full of either water, air, or other fluid, for the purpose of obtaining a continuous and forcible flow, or jet of water, or air; also the manner in which the said fluids are brought under the pressure of the weight-wheel, although it is effected through the agency of valves similar to those used in pumps, I consider as novel, as well as the way of constructing the flexible pipe. 2. To imparting a pressure to water by means of two cylinders, one containing steam, the other water, as above described, as well as the employment of weight-wheels, mounted on an axle, for the purpose of propelling locomotive carriages or boats. 3. To the motion given by the water to the slide-valves which direct the steam; and an application of these to any other purpose will be considered an infringement of this part of the invention. 4. To the tubes, through the agency of which the machinery is propelled, either upon the land or water, by introducing into them either water under considerable pressure, or compressed air.

Frederick de Moleyns, of Cheltenham, *for certain improvements in the production or development of electricity, and the application of electricity for the obtainment of illumination and motion.* Enrolment Office, Feburary 21, 1842.

These improvements consist—Firstly, In the production of electricity by certain novel combinations of known substances, whereby the electric power is largely developed by small quantities and superficies of those substances, with the important advantages of nearly perfect freedom from the noxious effluvia arising from certain combinations previously known, and avoidance of the use of mercury, and of undiluted acid, and the preservation of equal power for a long period.

Secondly, In the application of the electric power or principle, however obtained, to a new and improved mode of producing electric light, whereby that light may be sustained and increased, so as to make it available for lighting apartments, or for any other illuminating purpose.

Thirdly, In the application of electricity in its voltaic form when developing magnetic power in iron, to the production of a motive force of increased effect by means of improved modes of producing magnetism in iron, and of arranging and constructing the electro magnets.

The mode in which the first improvement is carried out, is described at great length, but it is briefly as follows:—One pound of nitraté of ammonia is dissolved in twelve ounces of soft water; to any given quantity of this solution an equal quantity of pure sulphuric acid is added, the solution being placed in a vessel containing pounded ice or other frigorific mixture, and the acid added very gradually to prevent heating. This mixture is then put into a stoppered bottle ready for use. A saturated solution of hydrochlorate of ammonia is also prepared. The battery consists of a glass, porcelain, or other suitable vessel, the internal measurement of which, is 3 inches by 2½ inches, and 3½ inches deep; in this is placed a piece of Mosselman's zinc, within which, and resting upon it, is a cell of seasoned sycamore, or porous biscuit ware ¾ of an inch in diameter, and the breadth and depth of the zinc which surrounds it. Within the cell is suspended by a binding screw from a brass bar, which crosses and rests upon the top of the outer vessel, a piece of thin sheet platina.

This battery is put into action by pouring some of the nitrate of ammonia and acid solution into the cell holding the platina; and a saturated solution of muriate of ammonia is poured into the glass vessel in contact with the zinc. A binding screw with a copper shank, is riveted (in preference to soldering) to the zinc, and on closing the voltaic circle, the battery is in powerful action, which may be kept undiminished for a considerable period. For producing an available light by means of electricity, a strong glass globe is furnished at two opposite points with openings closed by brass caps, through one of which, a vacuum can be formed within the sphere. The upper orifice has a glass or other insulated tube, which passes down

through the cap, and reaches nearly to the centre of the sphere; this tube is made to taper at its lower end in a cone-like form, so that its lower opening does not exceed the eighth of an inch in diameter. A thick copper wire passes down through this tube, working in air-tight collars in the brass cap, and reaches to within a quarter of an inch of the conical end of the tube, where it is united to a piece of fine platinum wire; this platinum wire, which is coiled in a spiral form like a corkscrew, passes through the opening of the tube and projects into the centre of the globe. Opposite to this wire, which forms one of the electrodes of the battery, is another thick copper wire which passes through the opposite brass cap, and terminates in a fine platinum wire similar to the former, only that it contains a small piece of spongy platinum. The upper glass tube is filled with finely powdered box-wood charcoal, or plumbago.

On completing the connexion between the two electrodes of the battery, the charcoal powder or plumbago falls in a minute shower upon the platinum wires and ball, and a continuous and intense light is given off. The dimensions of the platinum wires are to be so adjusted to the power of the battery, as to become intensely heated, but without being fused.

Two modes of constructing electro-magnets are next described, by means of which, the patentee states, from a given weight of iron more attractive power may be obtained, than has been hitherto developed in any other form. In the first mode of construction, thick copper or other wire, properly covered, is laid upon a strip of sheet iron, and the iron is rolled up into a cylindrical coil enclosing the wire. In the second mode the wire is coiled round a small soft iron cylinder, which is placed within another a size larger; wire being coiled round the second cylinder, it is placed in a third: and so on *ad infinitum*,, until any required degree of power is obtained.

In order to apply the above described, or other electro-magnets to the production of power, a series of electro-magnets are placed through circular holes at regular distances all round the felloes, or rim of a wheel fixed in a metal or other frame, and parallel to its axis. An equal portion of each magnet projects at either side of the rim of the wheel, and fixed in frames on each side of the wheel and parallel to it are a similar number of electro-magnets corresponding in size and strength to those in the wheel. The spokes of the driving-wheel are of sufficient substance to admit of a certain number of straight electro-magnets being passed through them, also parallel to its axis; and in the frame on each side of this wheel are fixed electro-magnets radiating from a centre formed by the axis of the driving-wheel, which work in the frame, and in their relative distances from each other, corresponding with the magnets fixed in the driving-wheel. The poles of the magnets in the frames are opposed to the poles of the magnets in the wheel, during the revolution of which attraction is converted into repulsion, by a change in the polarities of the fixed magnets, effected by a commutator worked by the wheel. The patentee states that he should prefer suspending, or cutting off the magnetism, to changing of the poles, but that he is prevented from using that expedient in consequence of its having been previously patented. The fixed magnets are worked by one battery, and the moving, or wheel magnets, by another.

The claim is, 1. To the development of the electrical principle by means of a combination consisting of a liquor composed of nitrate of ammonia, or nitrate of potassia, or other soluble nitrate, water, and sulphuric acid, in the proportions before described, or in other proportions, in association with platina, or other negative metal, or precipitate of one metal upon another, or upon other substances, not metallic, which may be substituted for the metal, and which is capable of resisting the action of such compound liquid; and further consisting of a saturated aqueous solution of muriate of ammonia, or muriate of soda, or other soluble muriate, or sulphate, or nitrate in association with zinc, or other positive metal—the whole forming a voltaic circle or combination, consisting of the acidulated nitrate solution, platina—saturated solution of muriate of ammonia, zinc—with the addition of a wooden, or other diaphragm. Also the compound liquor of which nitrate of ammonia, sulphuric acid and water form the ingredients, in the proportions set forth, or in varying proportions; or of which a different soluble nitrate, a different acid, and water, are ingredients, inducing, however, when combined, a similar play of chemical affinities, during the development of electricity in a closed voltaic circle.

2. To the application of electricity, whether produced by the foregoing contrivance, or by other means, to the development of a sustained light by the mode before set forth and explained; that is to say, by the use of pulverized charcoal or plumbago, in connexion with fine platinum, or other wire, or spongy platinum, or both; and also the mode, or mechanical means by which the charcoal, &c., is brought into contact with the platinum, or other metallic electrode.

3. To the two modes of forming powerful electro-magnets, before described, and also the particular modes of arrangement of the said improved electro-magnets, or other forms of electro-magnets in the electro-magnetic engine.

4. To the particular mode of construction of the motive apparatus before described and set forth, as intended to convey motive force to machinery, and to display the greatly increased force produced by the described arrangement of electro-magnets.

Edmund Morewood, of Highgate, Gentleman, *for an improved mode of preserving iron and other metals from oxidation or rust.* (A communication.) Enrolment Office, Feb. 26.

This invention consists, first, in tinning the metal, to be preserved, and then in zincing the tin, so that both the tin and zinc shall have a combined influence in preserving the metal.

The iron is first tinned by any of the methods now in use. The coating of tin, after having become hard, is well cleaned; the tinned metal is then immersed in molten zinc, its surface being carefully skimmed and covered with powdered sal-ammoniac. The tinned metal is suffered to remain in the molten zinc (which should be kept as near as possible at the melting point) until, on drawing it out slowly, the surface presents a smooth and even appearance.

Almost immediately after being taken out, and before the coating has become set and hard, the coated metal is immersed in clear water, then scrubbed and cleaned therein, and afterwards dried in bran or sawdust.

The claim is, to the preserving of iron and other metals capable of being tinned, and fusing at a temperature of not less than one thousand two hundred degrees of Fahrenheit, from oxidation, by tinning them and then dipping the tin covering or surface into molten zinc; or otherwise coating the tin covering with zinc in such manner that a union or contact shall take place between the surfaces of the zinc and tin, whereby a united influence is caused to be exerted for the preservation of the iron or other metal. This influence the patentee believes will prevent the destructive influence of the tin upon the iron when tin alone is used, and tin lessens the destructive influence of the iron upon the zinc, when zinc alone is used to cover the metal.

Thomas Chambers and Francis Mark Franklin, of Lawrence-lane, London, and Charles Rowley, of Birmingham, *for improvements in the manufacture of buttons and fastenings for wearing apparel. Enrolment Office, Feb. 26.*

The first part of this invention relates to the shanks of buttons. A piece of metal is stamped or bent so as to present the appearance of a small cross supported on four upright legs, each leg terminating in a horizontal projection or foot. In applying this shank to buttons the "collet" at the back of the button has an opening in the centre to allow the cross part of it to pass through, the feet remaining within the button, and preventing the shank being drawn through the opening. The button can be covered in the usual manner.

The second part relates to another form of shank to be applied to covered buttons. A circular disc of metal perforated with four holes is sunk in the shape of a hat, and the rim, or flanch, prevents the shank from being drawn through the hole in the collet when the centre part is protruded through it.

The third part relates to forming the collet or metal back of covered buttons of steel, so that it will lap over or cover the edges of the button. The covering is made on the front shell of the button, and the collet is made with a rim turned up; the covered shell is then put within the rim, and the rim closed over its edge.

The fourth part relates to a mode of constructing buttons with movable shanks, formed like the one last described, only, that instead of having a circular flanch to prevent its being drawn through the collet, it has two arms in a line with each other, one of which has a small stud fixed in its extremity. The collet has an opening to receive the centre part of the shank and one of the arms, and another hole to receive the stud in the shank. Inside the shank hole is a disc of metal attached to a spring, which is enclosed between the shell and the disc, so that the disc will be pressed against the collet. To fix the button to the shank, one of the projections of the shank must be pressed under the collet; so that the projection with the stud may enter the opening, then, by turning the button one quarter round, the stud will go into the hole in the collet made to receive it.

The fifth part relates to an improved mode of making vest bands. The folded edges of the fabric of which the bands are made, are cemented together (instead of being sewn) by common flour paste, dissolved India rubber, or any other convenient cement.

The sixth part relates to constructing vest bands with eyelet holes or loops formed from one piece of metal, in lieu of having each eyelet hole affixed separately in holes formed in the edges of the bands. A piece of wire is bent at regular intervals in the form of eyes; the straight parts of the wire being secured in the edge of the band while the eyes project beyond it.

eventh part relates to a method of g elasticity to vest bands, and con- a flat metal bar having two slots in ction of its length, divided in the f the bar by a narrow cross piece of self. Two springs are formed around each spring being as long as one of s. The bar with its springs is en- rithin the fabric of which the vest re formed, and stitched all round. nd of each spring, next to the centre bar, is a small stud, which passes the slot of the bar and the double f the vest; by this adjustment, when of the vest are drawn in a direction ate them, the studs compress the which offer an elastic resistance.

ighth part relates to an apparatus for g stocks. A ratchet bar is fixed to l of the stock, and a plate having a fixed thereto on the other. On the that socket is a spring fixed to the one end and having a stud at the a projecting edge of this spring passes a slot in the top of the socket, and one of the notches in the ratchet bar, lding the bar in whatever position it forced into the socket.

ninth part relates to a mode of con- g elastic fastenings for stocks. This g is somewhat similar to the vest- ring described in the seventh part of aprovements. Sometimes an India- strap is used.

tenth part relates to a mode of con- g fastenings for straps or trousers. h end of the strap a metal plate is having a slot formed in the centre d a groove on each side. To the are affixed other plates, each of as a flat spring attached to it, with turned down so as to fit into the slot trap-plate, thus acting like hooks and holding the parts together until the the strap is slided sideways, by which ve on one side of the slot will raise k of the spring out of the slot and hem.

eleventh part relates to an improve- breast-pins, and consists of a pro- point affixed to the stem, and turned rds the head of the pin. The stem in is forced into the neckerchief, or nt, as far as the lower part of the the pin must then be raised, so as to e guard to enter the neckerchief; in nt of the pin being raised with the n of removing it suddenly, the guard vent it.

welfth part relates to an improved eye, to be used with hooks in fast- arts of garments. It consists of a *wire slightly bent in the form of a* crank, so that it is attached to the garment by the two ends, while the hook takes into the bent part which projects beyond the edging.

The thirteenth part relates to a mode of making bands for drawers, so that they can be fastened in various positions. The novelty(?) consists in applying a series of eyelet-holes and hooks; the band being graduated by a series of rows of holes, the hooks can take into any of such holes, and the band be retained tightly round the person, rendering strings at the back unnecessary. In place of eyelet-holes, rings may be affixed.

The fourteenth part relates to a mode of applying elastic India rubber straps to children's shoes, in place of the leather, or non-elastic straps heretofore used. The two ends of the strap are fastened by a hook and eye, or other convenient means. Another very questionable novelty!

The fifteenth part relates to a mode of making brace and other buttons of the vegetable matter called "ivory-nut," or "vegetable ivory," instead of common bone or ivory.

Joseph Cooke Grant, of Stamford, Ironmonger and Agricultural Implement Maker, *for improvements in horse-rakes and hoes.* Enrolment Office, March 8, 1842.

This improved horse-rake consists of a short, but very wide quadrangular frame, mounted on a pair of wheels, and drawn by shafts in the usual manner. Within the frame a series of arms are placed side by side, throughout its whole width; each of the arms is driven into a cast-iron socket, and a bolt passing through the whole forms a joint or axle on which they are free to vibrate. At the opposite end of the arms is placed a curved tine or tooth, the curve being continuous, and nearly conformable to the arc described by the end of the arm. Each of the arms is connected with a beam lying along above them, and resting on suitable stops, by means of short chain links or other free connexion, so that when this beam is lifted, it raises the whole of the arms and tines. This beam is attached to a pair of levers moving on fulcra attached to the framework of the machine, the inner extremities or ends of the levers being attached by means of connecting-rods to a second lever or levers, which are jointed to the front of the machine, and, passing over the whole, terminate in a handle behind it. On pressing down this handle, the second system of levers is acted upon, which raises the beam, and with it the arms and tines or teeth of the rake, which, from their peculiar curved form, readily free themselves from any accumulations of hay, straw, &c. A catch is provided for holding up the teeth when the rake is travelling from one field to

another. The horse-hoe is constructed in a similar manner to the foregoing, the hoes taking the place of the tines or teeth, and being elevated in the same way.

The claim is, 1. To the mode of connecting the arms of horse-rakes with the axis, by applying the combination of cast-iron sockets, as described; 2. To combining the independent arms of horse-rakes with curved tines or teeth; 3. To the application of the combined motion of two levers working on different axes, in combination with the long bar, to facilitate the lifting of the tines or teeth of horse-rakes; 4. To the application of a lever to horse-rakes, when so connected with a bar for raising the tines or teeth, as to require the lever to be depressed in order to lift the tines or teeth; 5. To the mode of applying the compound lever action to the bar of a horse-hoe, having independent arms as above described.

NOTES AND NOTICES.

Mule-spinning.—Mr. Horner, one of the Factory Inspectors, states in a recent Report, that in a mill in Manchester, where they spin the finest number of yarns, one man now works, by means of eight double-decked mules, the amazing number of 2,592 spindles.

The *Mammoth* steam-vessel, which has been so long building at Bristol, by the Great Western Company, but which is now, it seems, to be called the *Great Britain*, is expected to be ready to be launched in March, 1843.

Magnetism Extraordinary.—The following singular case of magnetic attraction is stated, in *Silliman's Journal*, to have occurred in the State of Maine. A bed of magnetic iron ore magnetized so powerfully the instruments used to break it up, as to adhere to them in large tufts of the fragments of the iron ore; and a crow-bar, suspended freely over the iron ore, took the position of the magnetic meridian, so as to become in fact a true, though gigantic needle!

Draining Machine.—At the last meeting of the Agricultural Society, Mr. J. G. S. Lefevre presented, on the part of the Board of Trade, an American draining machine, invented by P. D. Henry, of New Orleans, U.S. The object of this machine is to raise water from a low place to a higher one, and the inventor proposes to accomplish this purpose by means of a hollow revolving hydraulic wheel, placed vertically at one-third its depth in the water, and divided into scooped compartments provided with valves which, as the wheel turns round, admit the water and retain it until a certain elevation above the surface has been attained, when the inclosed water falls back along radiating compartments towards the centre of the hollow wheel, and is carried away by a cylinder in a continuous stream. Mr. Henry enters into a detailed account of the particular arrangements by which this effect is produced in the most economical and efficient manner, and claims as the peculiar merit of his invention, the tangential manner in which the compartments of the hollow wheel are arranged in reference to the cylindrical conduit through its centre, and the contrivance of the spoons for scooping up the water when the reservoir is low. Above the hydraulic wheel, when in use, is placed a man on a framework, who causes the great wheel to revolve, by turning the handle of cog-wheels acting on its circumference: and the inventor states that he found a wheel of 6 feet in diameter, constructed on this principle, and worked by one man, capable of raising 200 gallons of water per minute.—*Athenæum.*

Suppression of the Smoke Nuisance.—At the usual monthly meeting of the Commissioners of the Birmingham Street Act, on Monday last, on the minute in reference to the subject of an inquiry as to the best means of effecting an abatement of the smoke nuisance, having been read, Mr. Turner said that the committee were not prepared to make any report, but he was happy to inform the commissioners that the nuisance so long complained of in Birmingham, arising from the smoke of steam furnaces, was in a fair way of being done away with. The patent of Mr. Williams (of which Mr. Dircks was the agent) had been tried at Mr. Clifford's mill, in Fazeley-street, with the most complete success; and he believed that if the principle were generally adopted, the compiaints in reference to this subject would not only be put an end to, but that a considerable saving would be effected by mill owners and manufacturers in the reduced consumption of fuel; he thought it was the duty of those commissioners who had furnaces, to give the plan a fair trial, and thus set an example to others in abolishing a nuisance in Birmingham which had become almost intolerable.—*Mining Journal.*

Clyde Steamers.—"What do the champions of Thame supremacy in steam-boat building say now to Clyde-fitted steamers? The *Tay*, of the West India Company, and the *Princess Royal*, Liverpool and Greenock passage-vessel, have, I think, proved that the new theory of the wave current water-lines has been no fallacy. Of four vessels, namely, the *Clyde*, the *Teviot*, the *Solway*, and the *Tay*, the performance, (under circumstances in all respects similar,) has been exactly in the order in which the theoretical curve was more or less introduced in their construction; while that of the *Princess Royal*, regarding which there were no controlling circumstances to prevent its fair adoption, has not been equalled even by Mr. Smith's *Fire King*."—*From a Correspondent.* [The question of rivalry between the Thames and Clyde steam-boat builders has always turned less on the comparative correctness of their lines of construction, than on the degree of engineering genius and skill which they have respectively shown. The four vessels referred to may be the best moulded that ever yet ploughed the deep, and yet their engines be nothing to boast of. However, we gladly take this opportunity of bearing witness to a vast improvement, of late, in the workmanship of the Clyde-built engines: though still, as before, the Thames makers keep the lead in all that relates to reduction of weight and space, and increase of effective working power.—ED. M. M.]

The Anti-John-Scott-Russell is the fantastical name very rashly given to a small steamer which may at the present time be occasionally seen on the Thames, testing the capabilities of a new rotary engine invented by Mr. Beale. Mr. Russell may possibly be wrong in saying that there is nothing to be gained, in any case, by the substitution of rotary for reciprocating or oscillating engines; but, from what we know of Mr. Beale's whirligig, we should not say that the Scotch Professor's reputation for sagacity has much to fear from its performances. It was enacting wonders when we saw it—for *five minutes*—but *how long* may we expect it to work so? No longer, we fear, than numbers of the same ingenious class of novelties which have gone before it—to oblivion.

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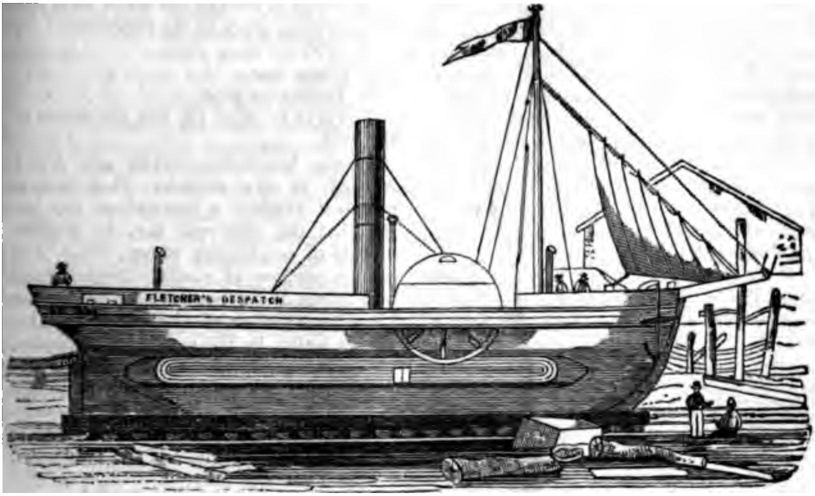
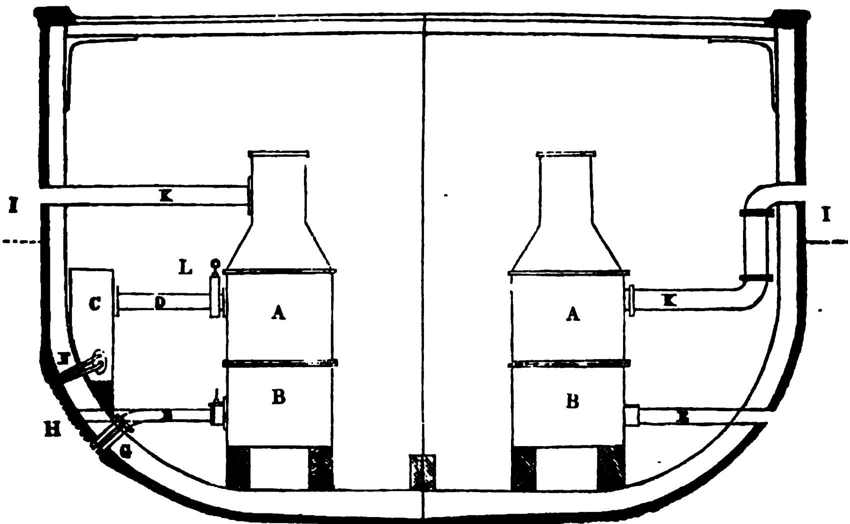
THE "DESPATCH," OF HULL, WITH SYMINGTON'S METHOD OF CONDENSATION.

Fig. 1.



The Symington Method. Fig. 2. The Common Method.



THE SYMINGTON METHOD OF CONDENSATION, AS APPLIED TO THE STEAM-VESSEL "FLETCHER'S DESPATCH," OF HULL.

Sir,—Were I not well aware that the most valuable and simple inventions are generally the most difficult of introduction, I might long ago have despaired of the general adoption of the Symington Method of Condensation, an invention which, I feel fully assured, will yet prove highly important to steam navigation. Of its successful application, *for a period of more than two years and a half*, to the *Fletcher's Despatch*, of Hull, some notice has been already, more than once, taken in the *Mechanics' Magazine*; and as no stronger evidence than this case affords can, probably, be adduced of the sterling merits of the invention, and need not, indeed, be required, I am induced to solicit a place in your pages for the following additional particulars, and for the illustrative engravings which accompany them.

It is now approaching to three years since the Symington Condensing Apparatus was fitted to the *Despatch*, whose worthy and spirited proprietor has repeatedly borne testimony to the advantage he has derived from it. In letters lately received from him he says, "I am so highly satisfied with your system of condensation, that I would do any thing in my power to assist you; for I do think, were it universally adopted, it would prove a great public benefit." Again: "With regard to the quantity of tallow used, I beg leave to say, that just one-half is used, when working the new, less than what was used on the old plan." And further: "The Captain says, the saving of fuel is immense, and he hopes never again to use the old plan; for the foamentation was tremendous, and they had often to stop the engine, it being impossible, at times, to get steam; while, with the new plan, steam is abundant, and wasting." Mr. Fletcher says, in conclusion: "I am perfectly satisfied, and so will any person who tries it."

Fig. 1 of the accompanying engravings is a perspective view of the *Despatch*, showing how far its external appearance is affected by the addition of the Symington apparatus. Fig. 2 is a transverse section of the hull, showing on one side a condensing apparatus on the ordinary plan, and on the other the (slight) additions necessary to be made to obtain all *the advantages of the new system*.

A Hot-well.
B Condenser.
C Tank to receive the water from the hot-well.
D Pipe to convey the water from the hot-well to the tank.
E Injection-pipe.
F Pipes to convey the water from the tank to the refrigerating pipes.
G Pipes to convey the water from the refrigerating pipes to the condenser.
H Refrigerating pipes.
I Water line.
K Discharge pipe.
L Valve to shut off the connexion to the tank.

It was but a few weeks ago that I learned, to my surprise, that several practical gentlemen entertained the belief that the plan was for the purpose merely of condensing steam, since it is for the purpose of cooling the hot water now thrown overboard, formed by the blending together of the steam and injection water in the common condenser, an error which the accompanying engravings, if you favour them with a place in your Journal, cannot fail to remove.

With best thanks for the favourable opinions you have given of the invention,

I remain, Sir,

Your most obedient servant,

ROBERT BOWIE.

Burr-street, Feb. 25, 1842.

ON THE IMPROVEMENT OF BOILERS. BY C. W. WILLIAMS, ESQ.

Sir,—The following explanation of the circumstances which led me to take the prominent part I have done in enquiring into the causes of the defects of steam-boilers may not be without its interest to your readers, and will, I trust, justify me in occupying so much of your columns with plans for their improvement. They will also be a sufficient answer to the assertion that "engineers and boiler-makers know their business too well to lack instruction from a pack of effervescent chemists and druggists;" meaning those chemical authorities of high standing, whose opinions I have cited in confirmation of the chemical views on which I relied.

Being much interested in the improvement of steam-vessels, from my connexion with steam navigation companies,

; had a longer and more experience in the details of their nd equipping than, perhaps, lual director of a steam comie kingdom, my attention has terruptedly given to the subthe year 1823, when I first l a steam company, and underave the first steam-vessel conapable of maintaining a comercourse across the Irish Channg the *winter* months; and then, had been considered im-:.

iat time, my object has been ting, through the instrumenie most experienced ship-buildam-engine manufacturers, the racticable degree of perfection ncy to every part of the hulls nery of steam-vessels.

spect to the improved state to *hulls* of steam-vessels have ght, I refer to the papers and ecifications for the building of those belonging to the City of am Company, as furnished by l Mr. J. C. Shaw, the Marine of that Company, to the Com- of Steam-vessels Inquiry, kes, Esq., Civil-engineer, and ringle, and printed in the Aptheir Report.

ractical illustration of the perwhich both *hulls* and *machinery* brought, I refer to the steam*ntal*, one of those now under ith her Majesty's Government ying the East India mails beat Britain and Alexandria.

ult of this long experience is ig, that, notwithstanding the state to which the construction ntments of the hull and general of steam-vessels have arrived, rtainty and risk of failure still the department of the *boiler*, iat belongs to *the use of fuel eneration of steam.*

certainly, has been done toparting strength to the boiler ning the risk of explosion.

ost experienced engineers are, still unable to decide, *previously* either as to the quantity of fuel be consumed or of steam gene-

rue, *the engineer*, who under*onstruction of the engines*, also undertakes that the boilers shall provide a sufficiency of steam to work them; but what that *sufficiency* means, has not been decided; and, in too many instances, the absence of some fixed data on the subject has led to complaints and references, which, though they may end the disputes between the owners and makers of the engines, leave the evils of a deficiency of steam or a great expenditure of fuel unabated.

If there happen to be "*steam enough*," the engineer's triumph is complete; although it is seldom that an account is taken of the quantity of fuel consumed, or whether it be attended with economy or waste. If with economy, the merit of the engineer is enhanced; but, if with waste, the sufferers, having no redress, keep their grievances to themselves, and the ledger account of fuel consumed, is the only index to the cause of that absence of profit which is the usual result.

Under the conviction of the danger of taking responsibility from the engineer, although alive to the prevailing uncertainty and risk, I felt, in common with other directors of steam companies, an unwillingness to interfere. From being so deeply interested in the improvement of this department of steam navigation, I have watched, with no small anxiety, the efforts of the engineers to arrive at some degree of certainty in what was admitted, on all hands, to be the most serious drawback to the application of steam vessels to long sea voyages. I perceived the absence of any intelligible or well-founded principle in the construction of the boiler;—that the part on which most depended, appeared least understood, and least attended to, namely, the *furnace*; and that this was too often left to the skill (or want of it) of working boiler-makers or bricklayers. I saw that, although the great operations of combustion which are carried on in the furnace, with all that belongs to the introduction and employment of atmospheric air, were among the most difficult processes within the range of chemistry, the absence of sound scientific principles still continued to prevail; yet on these depend the extent or perfection of the combustion in our furnaces.

Years were still passing away, and, while every other department was fast approaching to perfection, all that belonged to the combustion of fuel—the

production of smoke—and the wear and tear of the furnace part of the boiler, remained in the same *status quo* of uncertainty and insufficiency; and, although the recourse to new plans and new smoke-burning expedients continued, and every year brought fourth a new batch of infallible remedies for "consuming smoke and economizing fuel," success and certainty seemed as unattainable as ever, although there appeared such an abundance of labourers in the field of speculation and invention.

In fact, things seemed almost retrograding into greater doubt and want of system, rather than advancing to perfection, or even keeping pace with the improvements of the hulls and engines; and many of the furnaces, both of marine and land boilers, constructed within the last few years, with their arrangements for effecting a perfect or economical use of fuel, exhibit greater violations of chemical truths, and a greater departure from the principles on which nature proceeds, than any preceding ones which have come under my observation.

With respect to the all-important considerations, the quantity of fuel required, or the most judicious mode of effecting its combustion, the problem,—whether the boiler (for the furnace is never spoken of apart from the boiler) would generate more or less steam— produce more or less smoke—or consume more or less fuel —still remained to be decided by the *argumentum ad rem*, alone—*experiment;* and, if unsuccessful, the evil would be irremediable, and the owners doomed to eat the bread of disappointment, if not of loss. The result of a boiler, on being tried, turning up a trump, and giving "plenty of steam," with a small consumption of fuel, was, indeed, tantamount to a profitable employment of the vessel, while the reverse was inevitably attended with a succession of alterations, and, most likely, of loss to the speculation.

These were the considerations which operated with me when adding my mite to the inquiry, an inquiry which, it is manifest, will not be originated by the "working boiler-maker or bricklayer;" and, if I have not perfected the system which so loudly calls for improvement, I have, at least, directed the inquirer into *the right road.*

On my own part, the reluctance to interfere and share the risk of failure was put an end to by an *imperious necessity.* I was brought to the conclusion, that, to remain any longer a mere spectator of those abortive efforts towards improvement, and, in all cases, to wait the result of *trial*, before it could be ascertained whether a new boiler was to turn out good or bad, wasteful or economic, was inconsistent, if not with the progress of steam navigation, at least with the most vital interests of those for whom I was acting.

This *ultima ratio* for interference, *necessity*, became also the more urgent, since long sea voyages have been contemplated. The determination to examine for myself and exercise my own judgment was forced upon me by the failure of the steam-ship the *Liverpool*, on her first voyage to New York. I saw, that the owners and managers of steam companies could be in no worse position (as to risk or responsibility, touching the boiler department) from their interference, than that in which they were placed under the circumstances of non-interference.

The errors which led to the failure of the first voyage of the *Liverpool* were erroneously attributed to the interference of the managers or directors, and many unfounded reports were circulated. The failure was first attributed to "an expensive trying of experiments." Again, to an attempt "to try the celebrated Cornish principle of *slow* combustion, in order to burn the smoke." Again, and by the same party, to a system of "*excessive firing*," and "*over firing*," (the very reverse of the Cornish principle). It is only necessary to state, that no interference with the engineers, and no experiment of any kind, was made or attempted; on the contrary, a rigid determination prevailed against interfering with the makers of the boilers; and in fact, no injury or accident did occur to the boilers, much less occasion her putting back to Cork.

Among the proofs of this stationary or retrograding system I shall adduce the boilers originally placed in the *Liverpool.* I shall give the details of those boilers, and the several efforts, on the part of the engineers, to remedy what I will show were inherent defects, and instances of contempt for those chemical principles on which combustion and the right use

alone depend. I will show, that ie of that wasteful expenditure of iich marked the first voyage of *erpool* was induced by the origi--construction of the boilers, with enty furnaces—and by the injudi-iode of placing them in the ves-h the facility thus afforded to agement in their working; and e latter, combined with the ab-of sound judgment, in this in-on the part of those in command, unnecessary and wasteful expen-of fuel, in the teeth of written tions, at a time when common would have suggested its being ised and reserved, were the direct of the failure which attended the tempt of that vessel to cross the c. I will, from these facts, show, iowever well judged and consi-may be the plans of the directors m companies, however spirited their efforts to have every thing ect and efficient as money or deter-n can make it, yet still the compa-efficiency of a steam-vessel—the tion and patronage of the public—general success of the speculation—nainly depend on the manner in the engineer performs his part.

ı, Sir, yours, &c.

C. W. WILLIAMS.

RAINER'S GUIDE, BY CHARLES MOXON, LONDON.

lio volume, under this title, has peared, which is eminently qualified ply a desideratum which has long elt by a very large class of practical ental painters, and is well calcu-o correct the false taste which has rgely characterized most of our ons of woods and marbles. In his uctory remarks Mr. Moxon ob-, that "imitation of woods and es having now become a very nable style of decoration, and being l adapted to the character of our ngs, it has long been a matter of se to me that no one has hitherto pted, (at least with any considerable e of success,) to lessen the diffi-s that house-painters have to con-with in learning to imitate woods *arbles in a skilful manner.* There has been no lack of works on the other and older branches of ornamental paint-ing, for almost every month produces something new, although less useful to painters in general, in consequence of the prevailing taste of the public. Where there is one person employed in the other branches of ornamental painting, there are hundreds employed in imitating woods and marbles, and no doubt many more would be employed if the art were better understood. It is at once a recom-mendation to permanent and lucrative situations, to be able to grain in the most modern and improved manner. There-fore, as this knowledge of graining is of so much importance to those who are learning the art of house-painting, I trust that I shall not be thought pre-sumptuous in endeavouring, after a prac-tical experience, in London and Edin-burgh, of seventeen years, to place with-in the reach of all, what that experience induces me to believe to be the right principles of working."

Mr. Moxon then proceeds to give some general directions to be observed in imi-tating woods, of a most pertinent and practical character, with particular in-structions for the production of maho-gany, maple-wood, rose-wood, satin-wood, wainscoat, &c.; these being fol-lowed by beautifully-executed specimens of each. The author remarks, that "the chief object in view is to instruct those who are desirous of becoming good grainers, by placing before them speci-mens executed by hand-brush in the most simple and practical manner; in-deed, so much simplified, that any painter of ordinary capacity may, (by applica-tion,) in the course of a few weeks' prac-tice, be astonished at his own advance-ment. More elaborate or more highly-finished specimens would, no doubt, be more captivating to the inexperienced; but those who understand any thing about graining will at once perceive the advantage to be derived from copying these simple patterns."

In his general remarks on imitating marbles, Mr. Moxon observes, that "the reason why marbles are more difficult to imitate than woods is, that few people possess a good eye for colour. I have seen some of the very finest wood-grainers commence to imitate Sienna marble with a handful of small pencils, and more fine colours than Rubens would have required

for the painted ceiling at Whitehall. Now, all that is required for this useful imitation is black and red; for with these two colours, and the ground, which is yellow, may be produced a thousand different tints." Particular instructions for imitating the marbles most in request, with a beautiful specimen of each, are then given. These are followed by some highly useful observations on preparing grounds, and polishing, which, did our space permit, we would willingly have transferred to our pages.

The whole plan and execution of the work is highly creditable to the artistical skill of Mr. Moxon, who, in thus laying before his brethren of the trade, (or, as the grainers say, the profession,) correct models for their study and imitation, has done much to promote a taste for simplicity and chastity of design, which, being founded in truth, never fails to realize more or less of the perfection of beauty.

ON REMOVING THE HEATING EFFECT FROM THE SOLAR AND OXY-HYDROGEN MICROSCOPES.

Sir,—I have read lately, in the *Philosophical Magazine*, vol. x. p. 184, a description of a method of cooling, by a current of air, the heating effect on the objects exhibited in the solar and oxy-hydrogen microscopes. The object is stated to have been accomplished by the use of a pair of domestic hand-bellows, and with complete success, the thermometer indicating the temperature to be as low as 60° Fahr.; so that, to quote the words of the writer, "our solar and oxy-hydrogen microscopes, instead of being used for purposes of amusement only, and limited to the exhibition of objects which are unaffected by heat, may henceforward be employed for purposes of scientific investigation, and thereby assume the more important rank of valuable philosophical instruments." In furtherance of these views, I beg to propose the use of a revolving disc of glass, the lower half of which ought, probably, to be immersed in a trough of water, the upper portion passing over the objects in a space between them and the condensing lenses. Not having an instrument of the class by me, I have not had an opportunity of testing the value of this suggestion; yet there are, no doubt, some of your readers in possession of one, and if they will do so for me, I shall be very happy to hear the result. The glass disc may be made like the plate of an electrical machine, and may be conveniently set in motion by a lowering weight.

I am, Sir, yours, &c.,

S. M. Newman.

CONDENSATION OF STEAM BY COLD AIR. CRADDOCK'S PROCESS.

Sir,—With your permission I will lay before your readers an account of my patent condenser for steam-engines, and of a series of experiments made therewith; the latter of which will, I trust, demonstrate that the condensation of steam by the cooling effect of air, hitherto considered impracticable, is not only within the reach of possibility, but can be effected with such facility as to render its adoption general in those situations where a supply of water is not to be procured.

The peculiar feature of my invention is, the communication of a rapid motion to the condenser; independent, of course, of the motion which the vessel or locomotive may have, to which my condenser is attached. It will be unnecessary for me to detail my preliminary experiments, or the various forms which I have given to the condenser during my investigations: I will therefore at once describe the apparatus in that form which, from my present experience, seems to me the best. A hollow axis is supported by proper bearings in a vertical position. The lower end, or that at which the steam is introduced, is open, and works on a pivot fixed on the bottom of a chamber, on the top of which is a stuffing-box, through which the axis passes. Near the upper or closed end of the axis is an enlargement or chamber, from which proceed, at right angles to the axis, a number of radial hollow arms, into each of which the ends of a series of small copper tubes are inserted; these, of course, are parallel to the axis; their lower ends are inserted into other radial arms fixed near the bottom of the axis, and similar to those at top, excepting that their ends do not open into it. The radial arms at the bottom are all connected by their ends opening into an annular chamber. A

ıtary motion is given to the con-
by the steam-engine to which it
hed, the result of which is the
of the apparatus, and, conse-
, the condensation of the steam
ıas been introduced into the small
tubes. The condensed steam or
'alls into the lower radial arms,
hrown from thence into the an-
:hamber by centrifugal force; a
ump is affixed to this chamber,
piston-rod is attached to the clip
ed eccentric supported round the
e axis of the condenser. As the
travels about this eccentric, its
rod works to and fro, and the
is removed from the condenser.
rangement of the minor parts of
ıaratus, such as the conveyance of
:er to the boiler, the connexion of
-pump, &c., cannot be illustrated
t drawings. I may just remark,
hat the force-pump for the re-
of the water is not absolutely ne-
', as the air-pump may be made to
hat object. My experience, how-
lemonstrates that it is effected to
· advantage by its use.
ave attached a condenser of this
ɔ a high-pressure engine of five
power, and, by giving it a velo-
' 11 miles per hour, the water is
off at a temperature varying, with
f the air, from 90° to 120° Fahr.
lumn of mercury supported by the
n is not quite so high as it should
ording to the temperature of the
this, however, is owing to the
'ection of some of the joints in the
ıser, and will soon be remedied.
ower gained is more than double
quired to work the condenser and
mp. The amount of surface re-
to condense a given number of
feet of water per hour depends
velocity at which it is intended to
the condenser, and the temperature
ch the water is drawn off. It does
pear to me advisable to draw the
off at a temperature lower than
for a given abstraction of heat at a
temperature affects the height of
ercurial column much less than at
ıer; and any one familiar with the
cording to which heat passes from
ody to another need not be told,
ıe same surface will condense much
steam into water at 150° than at
A *condenser having a* velocity equal to 20 miles per hour, and the water being drawn off at 150°, will require about 2 ı square feet of surface per cubic foot of water per hour. The strength of the copper I have hitherto used is 1 lb. to the square foot, but I intend using it much lighter in future. The weight of a condenser equal to condense 10 cubic feet of water per hour will be from 8 to 10 cwt.

Besides the advantages which my mode of condensation possesses, in those situations where a supply of water cannot be had, I believe it possesses other, and scarcely less important ones. By my condenser returning the water to the boiler, I am enabled to use a tubular boiler, without experiencing that inconvenience which almost precludes their use in combination with the ordinary system of condensation, namely, the liability to become choked up by the deposit from the water. Although the condenser with which I am working is far from being tight in its various joinings, I have worked my engines constantly, for four days, without adding any water to the boiler; and I have no doubt that the condenser and engine I am now fitting up, and to which I hope very soon to be able to call the attention of engineers, will give results even more satisfactory than those at present obtained.

In conclusion, I have only to remark, that the apparatus and engine with which the above results were obtained may be inspected by any parties who feel interested in the matter, at my manufactory, 350, Coventry-road, Birmingham.

I am, Sir, &c.,

THOMAS CRADDOCK.

NEW AND SIMPLE METHOD OF OBTAINING MEZZOTINT GROUNDS.

Sir,—It gives me some pleasure to be able to announce that I can form a tolerably good mezzotint "ground" on a plate, by passing it along with a piece of common sand paper five or six times through the rolling printing press, with rather a tight pressure. The depth of colour, when printed from, does not quite possess the intensity of those executed in the usual manner; but the method answers exceedingly well for prints which are intended to finish in colours.

Sir, I remain your obedient servant,

LAURENCE BRUNTON.

March 14, 1842.

IMPROVEMENT IN LATHES

Fig. 1.

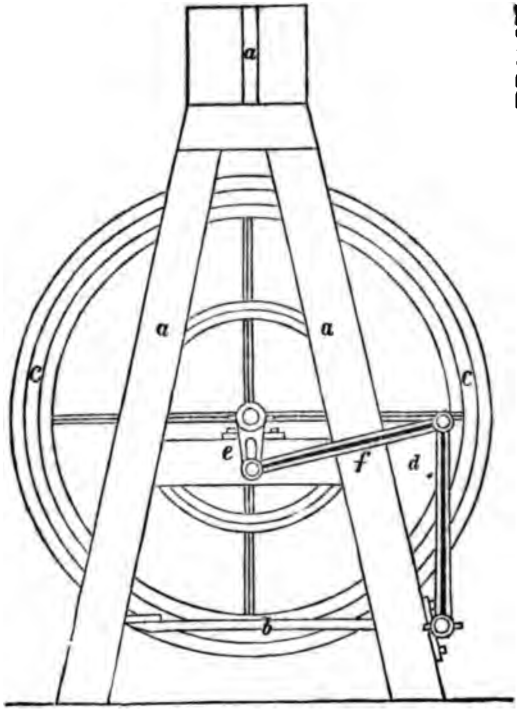
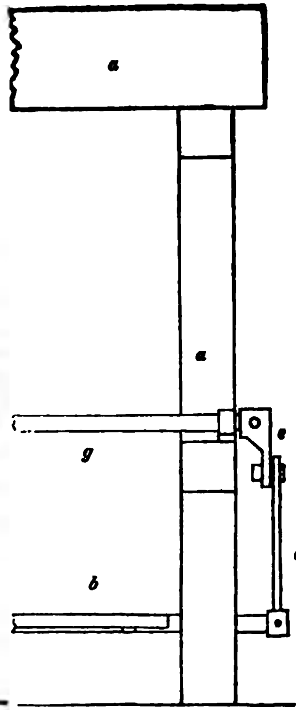


Fig. 2.



Sir,—The prefixed sketches represent an improvement in the lathe, which I believe to be original, and have found to add greatly to the ability of this valuable instrument. The figures are on the scale of an inch to the foot.

I am, Sir, your obedient servant,

H. Childs.

Laughton, February 24, 1842.

Description.

Fig. 1 is an end view of the lathe bed; and fig. 2, part of an elevation of the same, with the front leg removed. *a a a a*, represent the lathe bed; *c c* the wheel; *b b* the treadle, firmly fixed to the back bar *g*, which turns in brass bearings, fixed to the legs of the lathe as shown, and to the end of which is fixed the upright rod *d*, communicating with the crank *e*, by the connecting rod *f*.

It will be seen, on reference to fig. 1, that the crank *e* (which is fixed to the shaft *g*, at the driving wheel,) has a groove in the middle of it, which allows the pin, to which the connecting rod *f* comes, to be shifted to or from the centre and made fast at any required distance, as the case may require, by a nut and screw at the back.

H. C.

APPLICATION OF THE ELECTROTYPE TO THE MULTIPLICATION OF GRADUATED INSTRUMENTS.

Sir,—In your last Number, which has just been received, I observe mention made of a new application of the electrotype, by M. Peyré, for multiplication of graduated instruments. As the first to make the subject public, doubtless he has a right to the invention. The method was, however, proposed by me in December, 1840, "for producing graduated astronomical instruments from an original

scales, dials, &c.; and probably
ıcing plates of marking in in-
ıgs, &c., for printing from."
was tried by me, but only to a
:xtent, for the production of
he result of one experiment
electrotype scale, divided into
:hes. A variety of circumstances
l me from paying immediate at-
› the matter, or I should have
cated the results to you. The
I. Peyré will, I have little doubt,
ue, and the public will be in-
him for making them acquainted
further success of his process.
›ccurred to me, also, that the
pe process might be successfully
producing tools for re-grinding
ing specula, as the tool might
nade from the speculum itself,
l figure; and any number could
from the original tool, as those
ltered in figure. Tools might
made from *lenses*, for the same
If you think these hints likely
service, perhaps you will insert
the *Mech. Mag.*, and oblige,

Sir, yours respectfully,

N. S. Heineken.

ı, March 18, 1842.

ɜLE ACTING ROTARY ENGINE COMPANY."

:arn from some papers which
ı forwarded to us that a project
for the formation of a company
e above title, for bringing into
new motive power," which is
d to be incomparably superior to
d therefore infallibly destined to
ɜ it every where and for every
"Mighty agent" as steam is,
:presented to be mightier still.
application of steam there are
›ractical limits, but this new
a power which "can be carried
rtent." The cost, too, is not
ɛss than that of steam—it is
:ly less." People may send their
steam engines to the marine-
ɔs, and obtain as much for them
ıetal prices, as will suffice to
n "infinitely" better engines on
power plan. "The sale of
ted metallic parts" is to defray
' all expenses of every kind, both
ınd future. For, once erected,
ɛ on this new plan is to cost no-
next to nothing; "*no fuel*, of any kind is required"—no "daily maintenance"—it is to work without any "wear and tear," saving only the "mere loss occasioned by friction"—all that is wanted absolutely is, but a little oil or tallow to lubricate the parts occasionally—once a twelvemonth or so! Some of our readers (we hope *not many*, however) may by this time have pictured to themselves that "galvanism, or electricity" must needs have something to do with this new miracle of invention. No such thing—the mystery lies a good deal deeper. Neither galvanism nor electricity is of virtue enough for the accomplishment of such wonders; and "for this simple reason," says Messieurs the projectors of the "Double Acting Rotary Company," "*that they are convulsions of nature never intended by a Divine Providence for the use of man*"!!

Where then lies the grand secret? In a narrower compass than any thing so extraordinary was ever perhaps shrouded before—in a nut shell verily. You have but to place an empty cylinder, one half in water, or any other fluid, and one half in a vacuo—*that is, literally, all you are required to do*—and you shall cause it to revolve continually, and with any degree of power you please—remembering only to make your cylinder large enough! And for this other "simple reason:" there are "two tendencies to move" in the cylinder—the tendency of the part in water to rise, and the tendency of the part in vacuo to fall, and "the two tendencies being auxiliary to each *other*, *necessarily produce a continually revolving motion*!!!"

The thing is so like a *joke*, that it may be difficult to persuade our readers we are not joking. We describe the invention, however, with strict fidelity, as we find it described in the printed papers of the projected Company now before us. The inventor and his friends then must have deceived themselves? One would in charity think so; but if they have, it is not at least without sufficient pretence of ability to judge rightly, and without a great display of pains to go on sure grounds. The inventor is a "Count de Predaval," "who styles himself *Engineer* in the Service of his Imperial Majesty the Emperor of Austria;" and the Count, as a good and respectable engineer worthy of such distinguished patronage would do, has been careful not to submit his inven-

tion to the public till "after the *strictest experimental investigation has perfectly proved its merits.*" Nay more, "with a view to obtain the corroborative evidence of scientific men on his invention, *it was submitted to several eminent engineers;*" and a report of "*one of them*" is given at length, which we are told "*vouches for the excellence and applicability of the principle of the invention,*" as in sooth it does. Who the other "eminent engineers" were, and what they said of it we are not told. The Count, probably, thought that after "one of them," and he, no doubt, the most eminent of the lot, had said his say to such capital purpose, there was no need of further testimony. Would any one, after quoting a Wellington on a point of military skill, think of calling to witness either a Colonel Toby or Corporal Trim? But who is this selected "one"—the most eminent among the eminent—the Count de Predaval's Wellington of engineers? The Report is signed "Edward Lomax," and dated from "2, Queen-square, St. James's-park." We must candidly own that we never heard of the name of "Edward Lomax" before, far less of the engineering eminence attached to it. We live out of the world, however—the Count de Predaval in it, (not without some dark intent, we fear, to make of it "his oyster;") and the Count de Predaval says "Mr. Edward Lomax, of 2, Queen-square, St. James's-park," is an "engineer," and an "eminent" one, too; and the Count de Predaval is himself an "engineer," and "in the service of His Imperial Majesty the Emperor of Austria," &c. &c. &c.

Do not all these things, then, satisfy us? We must in sober seriousness say, they do not. We have no respect for "experimental investigations" which prove impossibilities—things which could never have been proved; and must doubt the mechanical knowledge and ability—if we may not the titles and the "eminence"—of those who "vouch" for them. We protest that we never, in all our experience, met with any thing more ridiculous than the pretensions contained in this "Prospectus" of the Count de Predaval; nor any thing more elaborately absurd than the "corroborative" Report of his friend, the Wellington of engineers, "Edward Lomax." The scheme is a veritable perpetual motion, and one of the most—if not literally *the* most—nonsensical and visionary of its class.

It may be asked, why, if it be so foolish a thing, we put ourselves to the trouble of this public exposure of it? We will tell our readers why. Had the scheme been left to depend on its own merits, or even on the authority of Mr. Edward Lomax—"eminent" as that individual may be—for acceptance with the public, we should not have thought of saying a word about it, feeling, as we should have done, well assured, that it could dupe nobody. But at the head of the "Prospectus" there are the names of a number of persons paraded, as constituting a "Provisional Committee" for the management of this projected "Double-acting Rotary Engine Company;" and among these there is one name which, if it were placed there with the consent of the owner, would of itself command for the plan the confidence and contributions of thousands. It is the name of one of our most learned Professors—of a gentleman of real and deserved eminence for his scientific acquirements, and scarcely more distinguished for academic lore than for practical wisdom, strength of judgment, and keenness of discrimination. Who, knowing any thing of Professor de Morgan, would think of asking whether it was a piece of moonshine or humbug to which he had given the sanction of his name? Or who, with money to spare, would hesitate much about paying down a few pounds to be one of "the first hundred" to share with the worthy Professor in the golden harvest of which M. the Count de Predaval offers to make them partakers, and in the "liberal premium" which the said "first hundred" are to have into the bargain, for benefiting themselves? Here it is the danger lies: here our reason for bidding all and sundry—beware! We have the authority of Professor de Morgan himself for stating that he never heard of this "Double-acting Rotary Engine Company," till he saw his name at the head of the Prospectus; that he knows nothing whatever of the scheme, or of its inventor, or of any of his associates; and that he utterly repudiates all connexion with them and it. We think our readers will agree with us, that this looks like something more than being self-deceived. People do not commonly use the names of other people, without their knowledge or authority, for any other purpose than that of wilfully deceiving others.

ire sham Provisional Committees n Boards of Directors such no- the annals of public delusion, ke it at all unlikely that some- the sort may be in course of per- here. We do but our duty, at all n making public what we know se; since every share of patron- nded to bubble schemes is not much diverted from the encou- t of legitimate ingenuity and en- but has a tendency to produce criminate prejudice against all ntions, to the grievous injury of solid worth and unquestionable ility.

FOR SILK— HYDROSTATIC PRES- RE ON THE VELOCIPEDE.

In reply to the question of your ident relative to a cement for silk, to give you the result of a success- iment I have recently made. Having t umbrella much rent and worn, and there absolutely seemed no sufficient that of a new cover, I caused a of odd pieces of silk to be cut into al shapes for covering the various d having procured a small quantity houc, in the liquid state, as sold by got it at a shop near the S.E. corner ter-square,) I spread with the finger piece a thin layer of the cement, as pon the corresponding pieces, at the the open umbrella; when dry I second and a third coating, after patches were applied to their res- places, and found to adhere very I have had the umbrella in use for nths, and find it absolutely imper- rain—in fact better than when pur- ew; and from the plan adopted in ically shaping the patches, the effect favourable than otherwise.

il myself of this opportunity to o your correspondent of Feb. 26, the end of the lever of his veloci- could contrive to inclose one or lumns of water, so as to bring to principle of hydrostatic pressure, I might prodigiously assist his power notion. The astonishing effect of ciple may be estimated from the Bra- s; and although, as a general rule, ained in power is said to be lost in ppears to me that the objection may ed.

I remain, Sir, &c.,

R. H.

e, March 10, 1842.

CASES IN SCREW POWER.

1. Suppose two screws made of metal of the same quality, and passing through nuts of the same thickness, but the threads differing in inclination, and consequently thinner in one than in the other, be opposed in their passage through the nuts by an equal amount of resistance—is the thread of one more likely to break than that of the other? If so, why? since, both being half thread and half space between, there will be the same quantity of metal to bear the resisting force.

2. If a screw with a considerable space between the coils of its thread, produce a certain pressure, with a certain force applied to turn it, will a greater pressure be produced with the same force, if one thread or more having the same inclination as the first thread, be inserted between its coils?

WILLIAM SPURRELL.

Carmarthen, Feb. 19. 1842.

WHICH OF THE COMMON WOODS ARE LEAST LIABLE TO WARP?

Sir,—If any of your correspondents can inform me which of the common woods, in boards, stand best without shrinking, swelling, or warping, in an atmosphere sometimes dry, sometimes replete with moisture, and at a temperature varying from 100° to 150° Fahr., I shall be greatly obliged by the communication. I do not apologise for this request, conceiving it to be one of general interest to mechanics. If the answer should be found among the deals or pines, it will be necessary to state the kind. Would kyanising, or any other process, be of advantage?

I am, Sir,

Your humble servant,

QUILIBET.

SUGGESTION FOR THE IMPROVEMENT OF MR. PILBROW'S ENGINE.

Sir,—Permit me to offer the following suggestion with regard to Mr. Pilbrow's engine: it is, that a pipe should be added to connect the upper and lower eduction ways, so that supposing the steam-piston to have completed its down-stroke, the steam may be allowed to flow into the top of the condenser, *without* giving injection, until the pistons are about half-stroke, when the top valve being closed, the remainder of the steam may be made to pass through the pipe into the lower part of the condenser, and condensed immediately. By these means there would be, for half the stroke, a vacuum in the top of the steam-cylinder, and during the

stroke, in the bottom of the condensing cylinder, and a certain amount of pressure in the top of the condensing cylinder. Of course the valves would be reversed at the opposite part of the stroke. It is unnecessary to enter into the arrangement of the valves required by this plan, the least complex being generally the best.

I am, Sir,
Your obedient servant,
THROTTLE-VALVE.

MECHANICAL CHIMNEY SWEEPING.

Sir,—I regret to say indisposition has prevented me from answering Mr. Baddeley's communication in your Journal of the 26th ult., under the head of "Mechanical Chimney Sweeping."

As I had no object, beyond that prompted by humanity, in bringing my plan for Mechanical Chimney Sweeping before the public, and as I have stated a sufficiency on the subject, and having no particular argument of Mr. Baddeley's to refute, I shall beg permission to leave the discussion at this point, feeling assured, that to occupy your valuable columns further therewith, would neither be interesting nor instructive to your readers.

I am, Sir, respectfully yours,
JAMES A. EMSLIE.

Newcastle-upon-Tyne, March 18, 1842.

PREVENTION OF RAILWAY ACCIDENTS.

Sir,—In your valuable Miscellany, Part 228, is an article under the title of the "Modern Mechanical Moloch," in which you dilate in strong and deserved terms upon the carelessness and supineness of railway companies respecting the safety of the lives of passengers, and the evident want of means to remedy this dreadful evil. From perusing the above, and from other causes, I have thought much upon the subject, especially as relates to the frightful consequences of concussions, and I feel convinced, that by a proper application of mechanical power these evils may be removed. I have devised a plan for this purpose, and constructed a working model which answers my most sanguine expectations; the principles of which are an improved buffer apparatus, by which a motion of two yards may be obtained; and in connexion therewith a self-acting break, on a very simple principle, both of which can be applied at a very trifling cost.

Not being in a position to give to the world the fruits of my labour by a further elucidation of my plan, my object in now *addressing you is*, with your permission, to make the circumstance known, through your valuable Periodical, to those interested in railway affairs; and if any of your readers should think proper to communicate with me upon the subject, I shall be happy to afford them every information.

I remain, Sir, your obedient servant,
OLIVER MOORE.

Sneuton, near Nottingham.

P. S. I have also an entirely new and superior plan of a terminus buffer.

NEWEST CLYDE STEAMERS.

Sir,—I observe in your last Number 971, page 240, a paragraph beginning thus:—"What do the champions of Thames supremacy in steam-boat building say now to Clyde-fitted steamers?" and a statement follows in reference to "the theoretical curve" which I (and I venture to say many other of your readers) do not understand. However, I must beg to be allowed to ask, What do the champions of Clyde-fitted steamers say to the fact, that the engines of these fine formed wave line vessels which glide so freely through the water, are consuming from 12 to 14 tons of coal every twenty-four hours more than the Thames-fitted steamers? It has been found that the consumption of the *Thames* during her run out and home, has averaged 26 tons per day of 24 hours, while the "Clyde" and "Solway" are not burning less than 40 tons in the same time. What will the advocates of Scotch engines say to this? Here we have engines of the same nominal power employed to propel vessels of the same tonnage, yet one pair costs 14*l. per day more* for coals than the other!

I would again strongly advise the Directors of the *Royal Mail* Steam Packet Company, to adopt the plan of a log-book, suggested by me in your 958th Number. Those interested in steam-navigation could then judge for themselves, and I am quite sure the London engineers would not object to the result being published.

In reference to your observations on the combined cylinder engine erected by Messrs. Rennie, at Mr. Thomas Cubitt's, Thames Bank, I learn that some extensive experiments are being made with this engine, in order to determine the quantity of water passing through it as steam, together with the consumption of fuel and work performed, the results of which I think I shall be able to lay before your readers.

I am, Sir,
Your obedient servant,
L. P.

March 23, 1842.

'OHN-SCOTT-RUSSELL," CHALNGE TO THE WORLD.

our Number of the 19th instant, ,d of Notes and Notices, there is on the " Anti-John-Scott-Rusoat, which is propelled by a ro- the property of the inventor, eale, which article, I must conprised me more than any other n your valuable work. I have of being acquainted with Mr. ave travelled in his boat on very ons. And, as I have had conerience in steam-engines gene- that I am better qualified to : properties and power of the at boat, than the writer of the estion. Sir, I have so much its performance, that I hereby anonymous writer of the paran the Anti-John-Scott-Russell ined a promise of the use of her sion) from Greenwich to Richack, against any steam-boat in r 20*l*. And, as I do consider if made, would not be for the noney on either side, I propose unt be given by the winner, for of the Dreadnought Seaman's f, however, the writer of the ed to, should not feel sufficient n the *non*-performance of Mr. ne to accept this challenge, I e his silence into a retractation ent.

ider your publication to be ine benefit and protection of mence, and not its injury, I trust the above a place in your next ly so doing, you will confer a

Your very obedient servant,

JOHN BENINGFIELD.

et, Aldgate,
1842.

: also received a letter on this Mr. E. Whitley Baker, who ve been on board the boat in several occasions, and do not ier performances upon *five* ertions. On the Wednesday appearance of the article in tion, the boat left the five mile e Greenwich Hospital) and ardon Bridge Wharf against wind *thirty-three minutes*, stopping nel a few minutes for the graan engineer of eminence, and f course, a loss of time, &c."]

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

RICHARD WHITAKER, OF CAMBRIDGE, MACHINIST, *for improvements in cutting the edges of books, and paper for other purposes; and in impressing ornaments, letters, and figures on the binding of books, and on other surfaces.* Enrolment Office, March 4, 1842.

The first improvement refers to the cutting-press. Instead of the sliding cheek being urged forward by two screws, as is usual, there is an endless screw lying horizontally opposite the middle of the cheek, which takes into two horizontal toothed wheels; these wheels take into two toothed racks, proceeding one from either end of the traversing cheek. On turning the handle, therefore, the cheek traverses backward or forward, according to the direction in which it is turned, being held tight when screwed up by a pall and ratchet. Instead of the common groove on the left-hand cheek, a dove-tailed groove is employed. The books or paper intended to be cut are placed upon a platform or table beneath the press, which is raised or lowered by means of a pinion acting in two racks, very similar to the arrangement submitted to the Society of Arts, in 1832, by Mr. Penny, and described at length in our 22nd volume.

The plough adapted to this cutting-press has a brass or other metal sole, with a dove-tailed projection which exactly corresponds with the dove-tailed groove before noticed, as applied to the cheek of the cutting-press. A diagonal stay is also introduced, to counteract the *springing* of the knife.

For lettering and ornamenting the backs of books, the following apparatus is employed. The letters, ornaments, &c., employed are those invented by Mr. Baddeley, which are set up like type, within a chase of a new construction, at the back of which there is a box for receiving a heater. The book being placed upon the platform or table, and the press screwed up tight, the chase containing the desired impress is attached to a long lever terminating in a handle; the short arm of the lever is attached to an upright bar, from the lower end of which a cord passes down under a pulley, and thence up to a larger pulley or wheel having several rims or speeds. A large weight, (56 lbs.,) is suspended by a cord from one of these rims, its distance from the centre being regulated by the pressure required. On bringing down the lever, and pressing the ornament, &c., on to the arched back of the book, the shorter end of the lever rises, pulling round the wheel; the weight being thereby raised, reacts with great force upon the lever.

In order to insure a level and properly

curved surface to receive the impression, the back of the book is rolled, either before or after lining, with a concave metal roller under pressure.

The claim is, 1. To the mode of compressing books or paper to be impressed or cut by means of the pressers worked by racks and cog-wheels driven by a screw.

2. To the mode of raising the platform for supporting books or paper, by means of two toothed wheels and toothed bars.

3. To the application of a dove-tailed slide and diagonal stay to the blade of a plough.

4. To the manner of working a chase, or ornamenting impressing surface, by means of the lever and apparatus connected therewith.

5. To the mode of constructing a chase or frame for holding type or ornamenting surfaces for impressing books and other surfaces, whereby such surfaces are securely held in such chases.

6. To the mode of combining a chase containing impressing surfaces, with a heater-box.

7. To the mode of preparing the backs of books, in order to insure uniformity of impressing the backs.

William Crosskill, of Beverley, Iron-founder and Engineer, *for improvements in machinery for rolling and crushing land; and in machinery to be used in the culture of land.* Enrolment Office, March 8, 1842.

The machine for the first-named purpose consists of a strong framing fitted with a pair of shafts for drawing by horses. Upon an axis within the framing are mounted, so as to turn freely and independently of each other, a series of rolling surfaces, the outer circumference of which is indented, so as to form angular teeth around it. Other teeth are fitted with their points in the hollows of the angular indents, at right angles to the rolling surface; these latter teeth are not placed in the line of the radius of the rolling surface, but inclined to it, so that they enter the ground more perpendicularly, and thereby have an increased tendency to penetrate and break up heavy lands, clods of earth, &c. Each rolling surface being free to turn upon the common axis, independently of the others, will, it is said, be found much more useful and effective than those heretofore made. When the machine is to travel on roads, &c., two large running wheels are put on the ends of the working axis, and removed when the operation of the machine is to commence.

The machine to be used in the culture of grass land consists of a strong framing mounted on four running wheels, the front pair having a locking motion; the object of this machine is to cause narrow cuts or trenches to be formed, at short intervals, through the turf down into the soil, and to deposit seeds and manure in such cuts or trenches. An axis or shaft lies across the front of the machine, and carries two arms, which, by connecting links, move bars that slide in grooves at the ends; these bars are affixed to a series of blades or cutters, (six in number,) by passing through an opening formed in the upper part of each cutter. These cutters pass down through slots or openings in a horizontal plate; by this arrangement, whenever the cutters become clogged, (which they are very likely to do,) the man attending the machine lifts the cutters through the plate, which instantly clears them from the accumulated soil or turf. In order to lift the cutters, and also to regulate the depth to which they shall work into the ground, there are two side levers attached to the axis or shaft, having sliding weights, in order to regulate the pressure used to force the cutters through the turf. Other levers connected to the foregoing pass over them to the hinder part of the machine, where they terminate in handles within reach of the attendant. An ordinary drill is placed upon the machine, and motion communicated to it from the driving wheels by toothed gearing, in the usual manner.

The claim is, 1. To the mode of applying the teeth of the rolling surfaces for rolling and crushing land; also, the placing rolling surfaces having teeth on the outer circumference, in such manner as to turn independently of each other.

2. To the mode of arranging a series of cutters in a suitable carriage, for producing narrow trenches or cuts through the turf of grass land, whereby such cutters can be lifted and cleared from time to time, and combining therewith suitable drills for sowing seed and manure in such cuts or trenches, as above described.

Theophile Antoine Wilhelme, Count de Hompesch, Rurich Castle, Aix-la-Chapelle, *for improvements in obtaining oils and other products from bituminous matters, and in purifying and rectifying oils so obtained.* Enrolment Office, March 1, 1842.

The matters to which this invention refers are schiste, or clay slate, and asphalte. The invention consists of an improved process whereby a greater quantity of oil is produced, the quality improved, and the smell removed, or greatly modified; it further consists of a method of subjecting the refuse matter of these substances to a process, whereby it is rendered available for other useful purposes.

The inventor states that the oil possesses three different characters, viz., essential oil, intermediary fat oil, and thick oil, and which

ated by the following methods. te, after having been cleaned, re-powder, and sifted, is put into a placed over the end of a retort. the reservoir and the retort is an with two doors, one at the top ating with the reservoir, and one ttom communicating with the re-hen the schiste is placed in the re-e upper door is opened to allow it d into the box; the lower door is ed to allow it to pass into the re-upper one being closed to prevent e of the vapour. In the retort—a circular pipe—is placed an Archi-crew, by turning which the schiste forward; heat is then applied at of the retort until the temperature 100° Reaumur, when essential oil in vapour through a vertical tube ar the end of the retort, and thence other tubes into a condenser where oil is obtained. The charge having jected to this temperature for half the workman passes it by the appli-the screw, farther along the retort, is then subjected to a heat of 200° r; by this increased heat the vapour off as before through a separate tube ear the centre of the retort, thence other pipes into another refrigerator, e intermediary or fat oil is obtained. aving subjected the charge to this ture for about half an hour, the n again pushes the charge on to the end of the retort, where it becomes l heat, and the vapour given out s before, through its separate tubes, other refrigerator yielding the thick ery time the workman propels the orward he opens the doors of the re-so that the process is continued in its stages without interruption. The passed on to the end of the retort, ich it falls into a box beneath, where to cool.

phalte becomes liquid by the appli-f heat, it requires a different treat-m schiste, and the difficulty of dis-is considerable, because the bottom tort becomes covered with charcoal. t the distillation the inventor uses n retorts placed in a reverberatory fur-that the heat may act upon them on all Each retort is 12 feet long, and 1 foot ter, and contains from two to three pounds weight of asphalte. Five are placed horizontally in one fur-hich is of a semicircular form. The g end of each retort has an ascend-descending tube attached thereto; nding tube conducts the vapour con-the *most volatile oil into another* ence *it passes into its condenser*; the descending tube conducts the vapour containing thick oil into another condenser. For obtaining essential oil from asphalte a heat of 130° Reaumur is necessary, and for thick oil 250°. The refuse of the carbonized asphalte is a hard black coal, which may be employed for the same purpose as the refuse of the schiste. Thus two oils are obtained, viz., essential and thick; to obtain the intermediary, the thick kind is subjected to distillation in iron retorts, by which means the intermediary is separated from the tar, which is very fine, and can be employed in the preparation of varnish, and for all purposes where the bitumen of India is now used.

The third part of this invention relates to a method of rectifying the oil thus obtained for manufacturing purposes. The fat oil is subjected to a pressure of steam, by which means any essential oil that may remain will be forced out, and any empyreumatic smell removed. The oil thus prepared requires to be passed through an ordinary filter, and is then ready for application to all kinds of machinery.

The essential oils obtained by the different temperatures may be used as solvents for caoutchouc, the manufacture of varnishes, the preparation of colours, and other similar purposes.

The fourth part of the invention relates to the treatment of the refuse arising from the several operations above described. The ammoniacal water formed in the distillation of the schiste is used in the manufacture of ammonia by the ordinary means. The acidulated tar will be found applicable to the production of the sulphate of soda, &c., by an addition of chloride of sodium in the ordinary manner. The coal or carbon, which contains pyrites when taken from the retorts, is placed in closed boxes to prevent the contact of the air, which whitens it; when cold and well dried, it is placed for twenty-four hours in a leaden vessel with water acidulated with sulphuric acid, which penetrates through all the pores, and attacks the iron; after having soaked twenty-four hours it is washed with cold water until no trace of the acid is left; it is then subjected to renewed carbonization; the refuse thus recarbonized is withdrawn, broken, reduced to powder, and sifted, and may be employed as a discolourant in sugar refinery, as a manure, and as a black colour.

George Wildes, Coleman-street, London, *for improvements in the manufacture of white lead.* Enrolment Office, March 4.

The lead is melted and poured through a metallic sieve into water; 200lbs. weight of the lead thus granulated is then placed in a hexagonal or square tub of wood lined with sheet lead. A hollow axis goes through the centre of this tub, and revolves with it; at

its other end the axis communicates with a enerator of carbonic acid gas. The tub is placed so that the plane of its bottom forms an angle of 40° with the horizon, and is made to revolve at the rate of twelve or fourteen times per minute. The granulated lead being placed in the tub, a sufficient quantity of water must be added; being about half as much as the tub will contain in its inclined position; carbonic acid gas being introduced through the hollow axis, the lid or cover is put on, and the tub caused to revolve. In about twenty-four hours a quantity of white lead will have been formed, which is to be drawn off in vats, washed, dried, ground, and packed for use in the ordinary way.

The claim is to the formation of pure carbonate of lead, known to painters as good white lead, by the attrition of lead in water in closed vessels, supplied with carbonic acid gas; and the peculiar adaptation of the means above described.

NOTES AND NOTICES.

Death of the Electrical Eel.—The electrical eel, at the Royal Adelaide Gallery, died a few days ago. The cause of its death was mortification. It was brought to this country from one of the tributary streams of the river of the Amazons, about four years ago, and was the only one of its kind in Europe. Its structure was very singular. The seat of the electric power lay between the shoulder and the tail, and between the head and the shoulder. Its food was small fish, which it could stun and stupify by an electric shock, at two feet distance. The most interesting and beautiful experiment performed by its electricity was in setting fire to a piece of silver paper in a glass cylinder. One end of a conductor was attached to the paper, and the other to the eel, and by this means the paper was burnt. It was necessary that the eel should be irritated before it would send forth electricity.

Ploughing by Steam.—At a late meeting of the new Agricultural Society, which was held in Milwich School-rooms, Staffordshire, Mr. W. Blurton, of Field Hall, Uttoxeter, explained his project of employing steam, instead of animal power, for the important purposes of ploughing. He said:—" In trying an experiment a short time ago, I discovered that ploughing might be as effectually, and quite as easily, performed with the power behind the plough, as by the usual method of dragging the plough after the power; therefore, I conceive that four or five ploughs might be arranged, and be propelled by a locomotive steam-engine, so that poaching the land in wet seasons might be entirely avoided. Steam power equivalent to 694 lbs. would be sufficient either to drag or propel a double plough, at a proper width and depth, 2½ miles an hour, leaving an excess of power of 356lbs., which latter power may be applied as will be subsequently shown. It is a well known principle in mechanics, that by decreasing the speed you may thereby increase the power; therefore agreeably to that principle, viz., by reducing the speed to one-fifth of 2½ miles, or to half a mile an hour, five double ploughs may be propelled at once, which decrease of speed will render the ploughs much more manageable, and the necessary number of turnings at the extremities of the furrows will consequently be reduced in nearly the same proportion. There are various means by which increased power may be obtained by decrease of speed; and I will instance one familiar to almost all, viz., the common crane, which may be seen in most of the wharf yards in great varieties. An 8-toothed cast-iron pinion working in a wheel, will, by a common windlass and of one man, lift from the ground to the quired much more than half a ton. I wil for instance, that only four double ploug ranged, and that two of them shall turn t in the usual method towards the right han centre of the land or butt, and the two othe with the *mould boards reversed* turn the f the left hand, also towards the centre; t gether propelled forward by the engine wo plete what is now called a four-'bout land once. It will therefore be obvious to every farmer, that by such an arrangement th will leave two open furrows, both of them even at the bottom, which for all the pu steam-ploughing will serve as a railroa driving wheels of the locomotive engine along, and therefore much less *propulsio* required than if the wheels of the engine l on a soft or uneven surface. You will per in the arrangement previously made fou ploughs were mentioned, and the conse decreasing the number of double ploughs to four will amply compensate for, or any difference in draught caused by the the various tenacities of soil, or other circu The excess of power before mentioned acting on the foregoing principle of d speed, will, I conceive, be sufficient to the power necessary to move the engine al double ploughs moving at the slow speed mile an hour, and plowing furrows ten in would plough an acre in two hours, allow sonable time for turning at each end of t

Standard Weights and Measures.—A co was some time ago appointed by governm stitute a new inquiry into the present weights and measures, consisting of Sir schell, Professor Airy, Mr. Lubbock, a The commissioners have reported, 1. Tha be advisable to adopt a decimal comput weights, measures, and monies; 2. That t should be abolished, and avoirdupois su and, 3. That proper model standards sho vided.

Royal Mail Company's Steam Ships.—A having appeared in the newspapers, that size and general plan of construction steamers do not at all answer the expe their officers," Captain Chappell, the S the Royal Mail Steam Packet Company lished the following strong contradicti whole of the voyages," says Captain C., this Company's steam-ships have exceed mate which had been originally formed probable speed; and as relates to the particular, the only one of the Company which has yet returned to Europe, the C tinctly reports that her size, power, and tion, are admirably adapted for transatla gation. The following abstract from her conclusive, with persons conversant with voyages:—'The *Thames* was absent from altogether, 66 days; of these she was at various ports, 20½ days; and at sea, 45½ d distance run, 10,700 nautical miles—whic to a speed, throughout, of 233 miles per d

Errata.—In Mr. Heineken's descript Ancient lock of Combination, No. 963.

Line 3, for "Butens." read "Buteus.

Col. 2, 12 lines from bottom, read " ring, V I O A E M; the third, I D L N fourth, R E I A S T."

Ibid., 2nd line from bottom, read F I D E, C O L I."

Page 54, 1st col., 6 lines from top, read S I L E, D I V I."

Ibid., 16th line from top, for "Schweu "Schwenter."

In Table II., the fourth line should be E M;" the sixth line, "I D L N U A; t "R E I A S T."

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Mechanics' Magazine,

EUM, REGISTER, JOURNAL, AND GAZETTE.

3.] SATURDAY, APRIL 2, 1842. [Price 3*d.*

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

WORKSHOP BLOWPIPE.

Fig. 1.

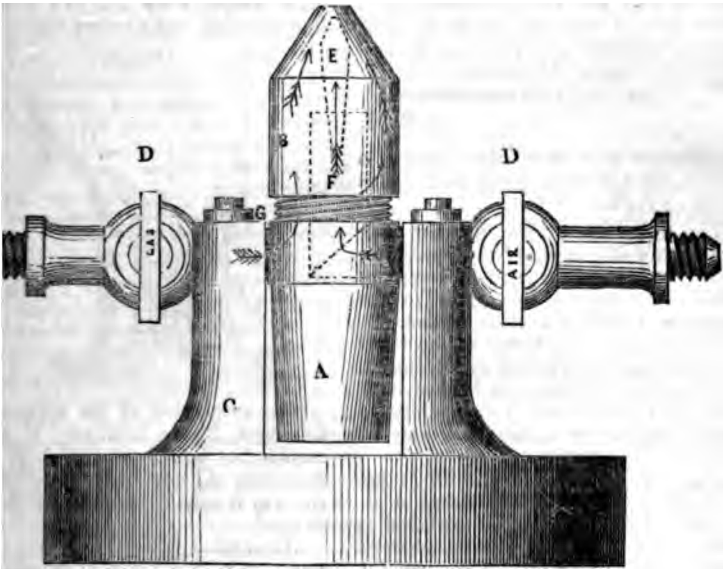
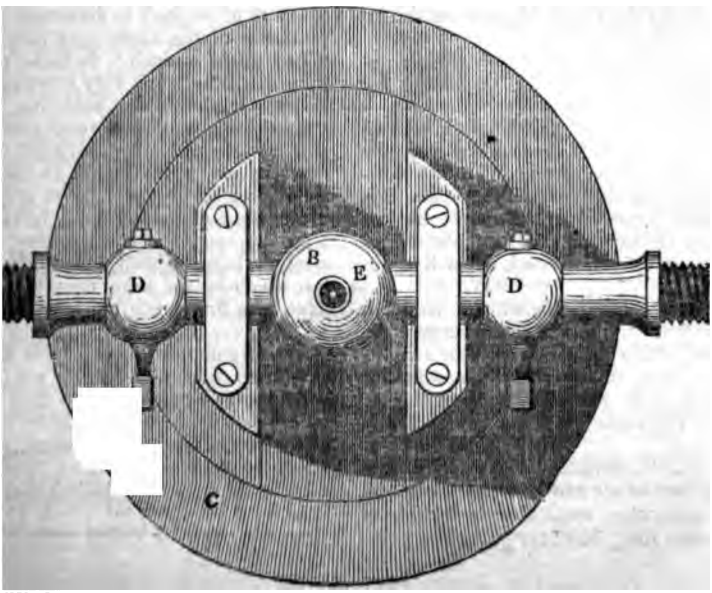


Fig. 2.



WORKSHOP BLOW-PIPE.

Sir,—I have found so much reason to be satisfied with the use of a little apparatus I lately made for myself, and have found it so much looked after by artisans in the place where I reside, that I venture to send you a description of it, in order that, if you think it likely to be of more extensive use, you may insert it in the *Mechanics' Magazine*.

I am, Sir, your most obedient,

K. H.

Description of a Blow-pipe Lamp of a convenient form for many purposes in the useful arts.

Fig. 1 is a front view, fig. 2 a plan, and fig. 3 a side view, of the apparatus, which may be constructed of larger or smaller proportions, according to the purposes to which it is to be applied.

A is a brass tube, closed at the lower end, and suspended in the wooden stand, C, by perforated trunnions having stop-cocks, D D, and screwed extremities, to which flexible or other tubes may be attached.

B, a piece of brass tubing, of the same diameter as A, but terminating in a cone, the apex of which is open. It is attached to A by the screwed part G, which requires to be so accurately fitted, that the combined tube may be lengthened or shortened by screwing or unscrewing B or A, without permitting the escape of gas from the inside.

C. The wooden stand.

D D. Stop-cocks for regulating the supplies of the gases.

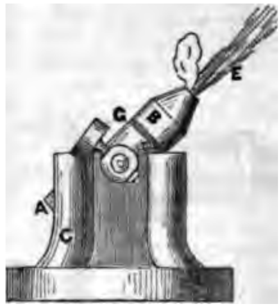
E. The nosel of the blow-pipe fitting into the socket F, concentric with the axis of A and B; the length of the shifting nosel should be such, that when B is screwed home on A, E should be just outside of the cone of B, and about one-eighth of an inch within it when B is unscrewed.

F is a continuation of the trunnion which leads to the air, or the oxygen gas holder, and is turned up in A by a right-angled knee, so as to bring the socket for E truly in the axis of the cone of B.

G. The adjustible connexion of A and B.

It will be obvious, on inspection, that *no mixture of air and gas can take place in this apparatus,* until they be outside of *it; and also that,* however great the pressure on the air-holder or bellows n it can never act in repelling the c of the inflammable gas, and that fore there is no risk of the flame blown out, which occasionally hap other lamps, when the two gase into the same cavity before issuing

Fig. 3.



The suspension of the appara trunnions, like a howitzer, is n sential, but is convenient, as it the means of directing the jet of fl any way it may be required for th in hand.

When this apparatus is made c a scale as to give 1 inch in diamet 3 inches in length, to A B, the tu opening in the apex of B may b ·15 to ·2 of an inch in diameter, a pin-holes of the nosels may rang ·01 to ·03 of an inch. In these p tions it will be found very servicea many workshops, for soldering smiths' work, hardening small stee and a variety of other purposes: latter its use is invaluable, as the site degree of heat can be so acc given, that no taking back is re after dipping; and the tenacity steel not being injured, tools so ha last much longer keen than whe have been first made too hard, an reduced.

When common street gas is u this lamp with atmospheric air, bellows may be employed to furn latter; but the better plan is to h air-holder under water pressure, v air-pump (similar to those com used for filling shower-baths) atta it to fill it by. An air vessel 15 diameter, and 15 inches deep, v

enough, under a pressure of from) inches, to keep the flame going, edium expenditure, for half an ·ithout pumping.

K. H.

14, 1842.

MANAGEMENT OF FURNACES AND .ERS—BY C. W. WILLIAMS, ESQ.

–In my last communication on bject, (No. 971,) I dwelt on the e necessity for having the means of ng what is going on in the interior aces, and gave a plan of one of my ·hich has been in use nearly two lescriptive of the mode in which sight-holes and thermometers for rposes of inspection. By these and with further aids, which I esently describe, the various pro- ınd changes, both in appearance nperature, which take place as tion proceeds, and the air is ad- or excluded, may be accurately l and studied. These are daily ed by scientific and practical men, eely express their conviction of essity for such inspection, before ı safely give an opinion on the ı, which they are thus enabled erately to examine and appre- ınd the causes which produce For, with what pretensions to ac- can we theorize on the chemical ical results arising from the ad- of air in different places and or how assert that it will pro- heating or cooling effect, unless, able means, we are enabled to n the fact, and test the correct- our own theories?

n, how can we assert, as has been ith more boldness than truth, en the coal gas (carburetted hy- ı is all expelled from the coal, and nace exhibits what is called a fire," there will be no combusti- passing over the bridge, and no for air in that quarter—an as- which the eye and the thermo- at once disprove, by the appear- ' a flame of considerable length ensity, whenever the means of inspection is afforded? Surely cts should operate as a caution deciding rashly on causes and and until the correctness of our *es can be determined.*

In the management of furnaces, so as to effect the most perfect combustion and the largest measure of heat, the main considerations are those which concern the admission of air, as to mode and quantity, rather than the relative proportions of fire, flue, and boiler surfaces, or such merely mechanical details—considerations which are but of secondary importance, and essential only as they influence the admission of air, and its operations. As to quantity, and the mode of introduction, it is difficult to determine which requires the greater attention, or in which we have been most at fault: in other words, whether more mischief has been done by the admission of a *plus* or *minus*, the true chemical equivalent, than by the mismanagement of the quantity actually introduced; for on each will be found equally to depend the generation of smoke with its accompanying nuisance and waste.

Let us now suppose a sufficient body of clear, ignited, solid fuel, remaining on the bars, preparatory to throwing on a fresh charge of coal. In a furnace in this state, it is supposed that there is no demand for air, except for the combustion of such solid matter, and that the natural approach for it is by the ash-pit. This impression is unquestionably erroneous, and must be disproved before we can duly appreciate the value or necessity for the introduction of air in any other quarter, or for any other purpose.

The impression here referred to is drawn from the unquestionable fact, that when we open the furnace door to admit the new charge, we see neither gas, nor smoke, nor flame. The cause of this fact, however, as already observed, has been overlooked, namely, that it is the very act of opening the door, and thus admitting a large body of air, which has produced this absence of flame, or gas, in the process of combustion. That this is true, is proved by the other fact, that if we close the door—admit air in a proper manner, and then look in from behind, where I have placed the centre sight-hole, (see engraving in No. 971,) a flame of considerable length and intensity will then be visible, by which we are forced to the conclusion that a considerable quantity of gas, of some description, is then generated in the furnace, and may be consumed if proper means be

adopted. This will hereafter be more fully examined when speaking of the use of coke or anthracite.

Thus we see how mere ocular inspection disproves our previous notions and theories, and establishes this fact, that before we throw on the fresh charge, there is a gaseous, as well as a solid body, available for the generation of sensible heat; and as both are combustible, each must be supplied with its due proportion of air before its combustion can be effected. The gas here referred to is carbonic oxide — always invisible — never producing visible smoke, and its presence only detected by its assuming the form of visible flame. This is the gas also which M. Faber, by his ingenious and scientific contrivance has now rendered available in many of the processes of manufacturing iron, and even where an intense heat is required.

The furnace being in this preparatory state, let us suppose that it is receiving a full charge, which shall cover such previously ignited and glowing mass with a stratum of coal from six to eight inches thick, (according to circumstances and the size of the furnace,) and sufficient to last a considerable time before it is again reduced to the same condition, and ready for another charge. A new state of things is now induced—much combustible gas (carburetted hydrogen) is evolved from the fresh coal, and a commensurate demand is thus created for atmospheric air. How then is such demand to be satisfied? It is manifest that unless such newly evolved gas be supplied with air, it cannot be consumed —yet it is equally manifest that in the very act of charging the furnace we have counteracted our own avowed purpose, by thus thickening the mass on the bars, and consequently obstructing the passage of the air through them, from the ash pit—thereby preventing the possibility of its access at the very moment we have created a demand for an increased supply.

This, which we may well call a practical absurdity of our own creation, has always been admitted, and hence the remedies which have been suggested, the failure of which may, in most cases, be traced to a neglect of the mode in which the air is introduced. It remains however to the objectors of the present day, to deny the principle of admitting air, *by a separate channel*, and behind the bridge, on the assumed ground that it creates the evil of not regulating the supply to the demand. Had the old plan of confining the admission of air to the ash-pit and bars been perfect in the way of regulation and adjustment, such objections might have had their weight; we have seen, however, that it is the reverse of regulation and the very antipodes of equalling the supply to the demand.

That there is some self-adjusting principle in the nature of combustion, (when not counteracted,) by which the quantity taken up or absorbed by the gas, shall, to some extent, correspond with the quantity required, we are warranted in believing, seeing how the varying quantities required for the combustion of the same gas in our lamps are supplied. We see, in the argand burner and solar lamp, how, by merely aiding the introduction of the air in a peculiar manner, we effect a more complete combustion, and by a species of self-adjusting appropriation. Why then condemn, against the evidence of our senses, the introduction of air to the furnace, on the same principle which is so successful in the lamp? Would not the inductions of common sense rather suggest an inquiry into the causes of such success, and whether there be not something peculiar—not in the air, or the gas—but in the *mode* of bringing them together? This consideration, however, belongs to another branch of the subject, and we are now but tracing the practical results in a furnace as they are presented to our view.

It will be admitted that effecting an absolute harmony between the demand for and the supply of air, is a desideratum of the greatest importance. If this, however, be not practicable, can we make no approach towards so desirable an object? At least, can we not correct the evil of the old system, which by diminishing the supply as the demand increases, produces an effect the very opposite of that which we are in search of? To this then let us direct attention, rather than by unmeaning cavil and theoretic objections, discourage useful investigation, and retard practical improvement.

It is manifest that the increased demand for air, on the new charge being thrown on the furnace, has been caused by the great developement of gas from such charge. It is also manifest that as the increased supply to meet such de-

annot be obtained by the old — the ash-pit and bars—some rangement, and some other chan- it be sought for. Two supplies ired, the one for the solid, and er for the gaseous combustible— are two distinct orifices for ad- called for; and as every intro- of new fuel creates a new and al demand for air, which cannot ined through the more than ever ted bars, a new and separate chan- admission becomes indispensable. f-evident remedy is providing two of supply, giving to each an in- ent action, and keeping both, un- circumstances, open and undis-

hus dividing the supply of air, re made the first step towards ion; for as the fresh charge of id, as it were, shut the door against nd its own demand—by giving a e door, we prevent the recurrence mischievous influence or inter- . Our next step is to inquire to xtent these separate supplies re- djustment. For this purpose we examine the combustible gases ed, and their order of succession he beginning to the end of the each succeeding charge being repetition of the same order of and effects. We shall thus have ire the results as to the tempe- produced, and the most desirable ticable management as regards the on and action of the air in sup- combustion.

fresh charge being in action, the gases will be, in the first instance, buretted and bi-carburetted hy- —the proportion of the latter being ed by the nature of the coal, and nsity of the heat in the furnace, no small extent, its depth and ition in the bars. This will be ed by the appearance of the gas bustion—the bi-carburetted being st brilliant white, and giving the st light behind the bridge, though in the body of the furnace. For rpose the furnace may be con- as a species of retort, with the duty, first, of generating the gas, en of heating it to the proper ature for chemical action—but y, to a very small extent of effect- combustion, and for the reason already adduced, namely, the impossibility of its being supplied with its equivalent of air. This mixture of gases then changes to that of carburetted hydrogen alone, which, continuing for some time with an uniform flow, gradually diminishes in quantity until the whole is expelled. The remaining solid matter or carbon, becoming clear and incandescent as these gases are evolved, produces that state of things which is essential to the generation of the carbonic oxide, and which, in its turn, increases to its maximum, as exhibited by its peculiar blue and transparent flame; after which it diminishes, the quantity evolved being in proportion to the quantity of solid carbon or coke on the bars—the activity of the draught, and the intensity of the heat in the furnace. If the air be excluded from behind the bridge, this gas (carbonic oxide) will be imperceptible, passing away useless, wanting its due supply of oxygen, and of course a *pro tanto* loss. If, however, the air be judiciously applied, so as not to produce a cooling effect, this gas at once becomes visible with its peculiar flame. The order in which the combustible gases present themselves for combustion will then be as follows:—

1. Carbonic oxide, before the charge.
2. Carburetted and bi-carburetted hydrogen.
3. Carburetted hydrogen alone.
4. Carburetted hydrogen and carbonic oxide.
5. Carbonic oxide alone.

In my next I will give a tabular view of the quantities developed; their respective lengths and temperatures, and the relation they bear to the admission or exclusion of the air.

I am Sir, yours, &c.
C. W. WILLIAMS.

Liverpool, March.

NEW METHOD OF ORNAMENTING FANCY CUTLERY.

Sir,—I beg to communicate to you a description of a mode of ornamenting sword-blades and fancy cutlery, which is, to my knowledge, quite new; and you will oblige me by inserting it in the columns of your interesting and useful Magazine.

The process is explained in a very few words. It consists in applying printed

impressions to the surface of the articles, and afterwards immersing them in the usual acid liquor. Sword-blades, knives, steel snuffers, and scissors—in fact, every description of fancy hardware goods in steel—can be thus beautifully ornamented, with expedition and cheapness. The plates from which the impressions are taken may be like those used by pot-painters for porcelain, but the ink should be composed of about equal parts of common asphaltum and bees'-wax, laid on hot, and printed at the rolling-press. Perhaps wood engravings might be employed for the same purpose; in which case, they would, of course, be printed at the typographic press, with an ink composed of asphaltum varnish mixed with a little bees'-wax. In both cases the goods ought to be warmed a little when the impression is transferred thereto, so as to cause the ink to adhere.

I am, Sir,
Yours respectfully,
M. T. Brazendale.

March 21, 1842.

METHOD OF PRODUCING EXCELLENT DAGUERREOTYPE PRINTS WITHOUT THE AID OF AN ENGRAVER.

Sir,—Every body who may have had an opportunity of seeing an impression from an electro-etched Daguerreotype plate will have perceived in it a generally poor effect, arising from the indent not being of sufficient depth to hold the molecules of the printing-ink in requisite quantity; this is at least the case if the minute details of the picture are left clear and well defined. On the other hand, should the plate be etched to the proper depth, all the exquisite and inimitable beauty of the finer parts is destroyed. The following method will produce an effect closely approximating to that observed in ordinary prints, and vastly superior to any of those heretofore executed *simply* by Mr. Grove's method.

A Daguerreotype is first etched by the voltaic process invented by Mr. Grove,* when an impression is taken therefrom, on "transfer paper," using the kind of composition ink usually employed for transferring operations.† This impression is transferred to a lithographic stone, the surface of which is finely *grained* by rubbing it with sand, and a muller. The stone is then prepared with acid, &c., and printed impressions taken as usual. The pictures are *positive*, that is, they have their lights, shades, &c., precisely as in nature.

I am inclined to think that laying an *aquatint ground* on the Daguerreotype plate, previous to its undergoing the electro-etching process, would greatly improve the copper-plate impressions, as by giving an uneven, instead of a flat surface, the ink will necessarily *hold* better. The etching-ground may, if thought fit, be taken off after the plate is slightly corroded, and afterwards finished without it.

I am, Sir,
Your very obedient servant,
M. T. Brazendale.

Newcastle, March 21, 1842.

* Vide Proceedings of the London Electrical Society, vol. i. 1841, page 94.

† That containing the smallest quantity of lamp-black ought to be chosen.

STEAM-BOILER EXPLOSIONS.

Dear Sir,—Previously to reading the paper of M. Jobard upon this subject, I had made several experiments, with a view of ascertaining whether, after the hydrogen gas is formed in the boiler from the decomposition of the water by the heated plates, the explosive mixture might not be completed by the steam itself, independently of any atmospheric air, which might obtain access to the interior of the boiler from the feed-pumps, or otherwise. From several experiments, accurately and carefully made, I am induced to believe that such is the case; and that when once an evolution of hydrogen gas has taken place in the boiler, we need not look for the other ingredient of a dangerous and highly explosive mixture, such mixture being immediately formed by the steam. I have burst a small wrought-iron boiler under such circumstances, that no air could possibly have been mixed with the steam, having first carefully expelled it from the water which I used. I allowed the water to get very low in the boiler, and fired it by means of a platinum wire ignited by a galvanic battery. When once we have an explosive mixture formed in the boiler, I think no difficulty will be found in kindling it: a sudden rush of steam will lift the safety-valve, when imme-

ly the electric spark will pass between .d the seat.

.nother theory, which I believe to be ely original, and certainly only the pring of the moment, is this: may ; a sudden evolution of steam or gas ıse a sufficient degree of compression produce ignition? We know that a ston, by being forcibly pushed down ıto a cylinder, causes sufficient heat to nflame amadon or German tinder—may ıot so powerful an agent as steam produce the same effect? However, this is but the idea of a moment; but every little helps to elicit truth.

I am, Sir,
Your most obedient servant,
COMMENTATOR.

Eltham, March 25, 1842.

WALKER'S HYDRAULIC ENGINE.

Sir,—The description of Walker's Hydraulic Engine, by Mr. Baddeley, in your valuable magazine, did, I must confess, a little astonish me; but not so much as seeing it at work afterwards at the inventor's manufactory. The term "cylinder" which your correspondent uses, led me a little astray so far as regards the exact principle on which it depends for action. I thought there was something *within* the cylinder which was not explained, and I have no doubt others of the many readers of your magazine have been led away by the same idea. However, upon examining the apparatus for myself, I find all that is required to raise water is a common zinc or other metal tube, with a valve at the bottom opening upwards. The enlarged space at the bottom is only to give more water way than would be afforded if the tube was of the same diameter throughout. There is one particular part which I wonder escaped the scrutinizing eye of your correspondent, and that is, the mode of putting a new leather or plate on the valve, when required, without a joint or flange on the pipe. There is no attempt in this instance to improve the ordinary pump, for every thing connected with it is thrown overboard, and an entirely new principle substituted of immense value, which will only be duly appreciated as it becomes known. A new field is opened for the expansive powers of never-tiring genius. Mr. Baddeley's account of it is very good; but it appears to me impossible to judge of its real merits without seeing it in action. I have no doubt the shipping interest will be the first to examine into the principles of this wonderful invention; as it appears to me well adapted for maritime purposes, and may no doubt be applied with certain success in all works of magnitude where hydraulic machines are indispensable, or where water is to be raised. I have given Mr. W. two orders for the purpose of raising water from foundations of buildings, which I have no doubt will be a great saving of labour, and also in repairs.

I am, Sir,
Your most obedient servant,
A BUILDER,
AND A CONSTANT READER.

London, March 29, 1842.

THE LEEDS SMOKE NUISANCE REPORT.*

The promised Pamphlet on the Smoke Nuisance, by Mr. West—the fruit of the great meeting at Leeds — is at length published, and we must confess that we are sadly disappointed with it. It is, in effect, little more than a gratuitous advertisement of all the schemes of all the smoke-doctors throughout the kingdom, with their names, addresses, prices, testimonials, &c.; differing chiefly from the useless Report of the sage Committee of the London Corporation in this, that whereas the London Report contained only seven plans, the Leeds contains, (with much vaunting of the numerical superiority,) "upwards of forty." The question of the practicability of annihilating the smoke nuisance, without prejudice to the many important manufacturing interests involved in it, is left just where it was; and instead of th pamphlet furnishing any help to manu facturers or others, to see their wa through the labyrinth of assertions and tes timonials—which last the most worthles

* An Account of the Patent and other Meth of Preventing or Consuming Smoke; with Act Parliament on the Subject, Evidence on Ind ments for Smoke Nuisances, and the Proceed at a Public Meeting of Patentees and others Exhibiting and Explaining Models. By Wil West, Professional Chemist, Leeds. Simpkin Marshall, London; Baines and Newsome, Lee

as well as the best, have at command—it only makes "confusion worse confounded." Many inventions, which had deservedly fallen into obscurity, are here resuscitated with the stamp of official notice, if not recommendation. The descriptions of several deviate materially from the original specifications of the patentees, the inventors having, apparently, availed themselves of what appeared to be the favourable points of others. One and all are depicted in the most glowing colours. Every one is just the thing for economy, and for consumption of smoke—though, whether it be possible to consume smoke at all is still a question in dispute among men of science. We had expected, at the hands of Mr. West, something like a rational, deliberate, and scientific analysis—something that should lead, rather than puzzle the practical part of the public—something that should at least have separated the dross from the ore, and have thus circumscribed the field of inquiry—something that might have served to take the subject out of the range of mere mechanical invention, which has too long usurped the place of science in all that relates to this matter. The merely enabling each pretender to throw his rubbish into the heap—thus overwhelming the little there is of a sound, useful, and practical character—has effected nothing towards clearing the way for those who are really desirous of abating the nuisance, or of enabling Parliament to legislate with safety. The Leeds Meeting should either have done more, or done nothing: much embarrassment, possibly much mischief, seems likely to result from this originally well-intentioned, but most abortive effort.

Some general remarks of a cautionary nature are indeed made by Mr. West, but not greatly to the purpose. He seems, evidently, to have been a good deal embarrassed by his position—between a desire to do his duty, as a reporter, with literal fidelity, and a dread of lending his authority, as a man of science, to any one scheme more than another. He has not thought it to be within his province even to analyze, much less to condemn or recommend. The pamphlet, as it is, seems to have cost him no little trouble, but it has been trouble thrown away, for the whole will be as soon forgotten as any other mere collection of advertising puffs. The practical reader and manufacturer may, in laying it down, ask, with equal propriety and success, the question which was put to the panegyrist of the far-famed Sorbonne, after a century of incubation—"Well, and what has it done?"

THE "ANTI-JOHN-SCOTT-RUSSELL" AND MR. BENINGFIELD'S CHALLENGE TO ALL THE WORLD.

The writer of the Note in the *Mechanics' Magazine* of the 19th instant, on the *Anti-John-Scott-Russell* experimental steam-boat, presents his compliments to Mr. John Beningfield. He admires Mr. Beningfield for his boldness in backing his friend Mr. Beale's "whirligig" against "the world," for a trip "from Greenwich to Richmond, and back again;" but begs respectfully to submit whether it would not have been as well to choose ground for the match, where "all the world," if so inclined, might enter into the competition. He presumes it must have been from mere oversight that Mr. Beningfield has pitched on a portion of the river where notoriously the swifter steam-boats do not, and are not, able to ply. What does Mr. Beningfield say to a trip the other way, from Greenwich to Gravesend, or from Gravesend to the Nore, or from the Nore to Calais? If he will amend his challenge, so as to give all "the world" plenty of room and fair play, it will very probably be accepted. Even then Mr. Beningfield, with his "considerable experience in steam-engines generally," must no doubt be well aware, success on either side would affect but little, if at all, the question raised in the Note to which his challenge is a reply. That question is this, simply—whether there is any thing in the construction of Mr. Beale's rotary engine to make it probable that it will, *in the long run*, work better than any of the numerous engines of the same class which have gone before it—to oblivion? The writer of the Note thinks there is not; and he is prepared to state his reasons, if Mr. Beale, or his champion Mr. Beningfield, will first of all, (to prevent any future cavilling about the facts of the case,) state in what respects the *Anti-John-Scott-Russell* "whirligig" differs from preceding rotary engines, and the special grounds on which the inventor flatters himself that he has succeeded, in so extraordinary a degree, where so many others have utterly failed.

London, March 28, 1842.

:TROPOLITAN MUSIC HALL—HANSOM'S NEW SYSTEM OF BUILDING.

ı is now before the public for ion of a Metropolitan Music ruly colossal dimensions. It is ' as large again as Westminster he noblest hall (*as yet*) per- ıe world;" and is to be capable ning fifteen thousand persons. n too is to be of corresponding e—"an organ exceeding in di- , power, and grandeur, all that nent, so great in this respect, can —"the ORGAN of London, of of Europe, of the World!" cost of the building (the most ; part to us of the whole affair) o more than £30,000.

uthor of this design is Mr. ansom, the architect of the uni- admired Town Hall of Birm- -one of the very finest of our ıublic buildings; and the means he calculates on being able to ıall of such unparalleled mag- : a smallness of cost so equally led, is the application to roof of the suspension principle, fol- the construction of the Menai, , and other iron bridges. We : following explanatory details ecture delivered last week by som, at the Music Hall, Store

ding to the ordinary system of he sides are made to receive, to and purposes, the whole weight f, and pressing unequally, that is, the beams or principals of the roof sversely upon the walls, and the reasing by confluence, as it were, he middle, that is, in the very art of the building. The ends, observed, equal in all the features, ity to sustain pressure, yet not ll, or at most, by the ends of a , resting on a dangerous and inse- . But the *corners* of the building *wers* of latent strength, if I may em, for all the purposes for which o eminently designed, seem as su- s the strength contained in them the present system of building is so regard them; but mind you, nly one plan by which this great ength and sufficiency can be called , and it is by proceeding on that ırinciple of making force converge e, instead of diverging from it, wards, as gravitation does, instead *outwards, as incohesive* and dis- turbed elements operate. And what think you is that mode of construction, which so calls into action this latent strength? It is neither more nor less than that of the suspension bridge.*

"By suspending, therefore, the great weight of the roof from the four corners, we not only impose the pressure upon fixed and equal points—and to impress equally—but we make use of the natural abutments, which the walls of the corners supply by their meeting, to prevent any derangement of the upright position; that is, if one of the walls could experience a draught inwards through the pulling force of the suspension rods, the other wall is pushing against to resist it; and so of each wall, mutually and reciprocally, and of each corner.

"Here then we fall again on another beautiful principle of the ancient masons. In their groined vaultings, they regarded walls merely as a means of inclosure, not of support; and hence we find, that the arch ribs were collected together at a small number of bearing points, or piers, (they might be termed the legs of the building), and their tendency to thrust outwards was counteracted by buttresses, sometimes flying over, from a distance of several feet, and crowned by heavy pinnacles to increase their resistance by weight. Yet beautiful, magically beautiful as was their device, we have no need of it; the very thing, which they resorted to, as an expedient, exists in the nature of the construction of all square buildings; and had they known of the principle of suspension, as they knew of that of the arch, of which their early predecessors were ignorant, they would no doubt have adorned and used it with similar triumphs.

"Away then with the necessity of outward buttresses, and massive side walls—away with columns of support—away with inequalities of pressure, and their consequence, fracture and derangement—all we require are the corners of our building; or, if we would lighten them still more, we interpose a strut between; but indeed the very outward frame of the roof performs this office; resisting compression, it also stays the corner piers in their place; it is their best, I may call it, their *faithful* auxiliary.

"Away also with high pitched roofs, and the steep sloping sheets of tiles and slates—the forest of timber, which so large a roof as this would require, loaded by its mass of

* "A building of great dimensions has recently been erected at Paris, called "La Rotonde des Panoramas." The roof, which is pitched, and partly on the old construction, is suspended by iron cables. The design is by M. Hittorf, architect of the French Government, under whose patronage it was built."

extra covering, grinding down the walls by their united pressure, and pregnant with the elements of decay and destruction (the liability of timber to rot, and its fearful combustibility). Away also with the drafts from the Northern forests of Europe, and our dependencies upon a foreign supply of timber. The mines and rocks of our native country are our resource, and our manufactures are stimulated. Iron, in its best form, in its malleable state, not cast; tensile to a proverb, as we say, "tough as pinwire." Iron rods or cables; iron rafters; iron gratings and frames, to receive an impermeable cement, all secure, and next to imperishable.*

"This little model shows how, with a load equal to fifty, nay, a hundred times its proportioned weight of covering, the rods perform their duty. And I must stop at this point to tell you, that the power of wrought iron to bear suspended weight is such, is so astounding, as that a rod 1 inch square, will bear 80,000lbs. or 35 tons. The whole weight of the roof of the proposed Hall will be about 200 tons, including that which is to rest upon the piers and arches, therefore four rods of an inch square each would suffice to carry it; but I should have a power equal to forty such rods at least, or ten times the bare sufficiency."

Of the soundness of this new principle of construction we have not a shadow of doubt; and cannot help wondering that with so many striking examples before our eyes of its successful application in bridge building, no one should before now have thought of its still greater suitableness to roofs of buildings of large area. Doubtless the saving must be great from dispensing with the huge system of piers, pillars, posts, &c., now requisite in all cases, where roofs of large dimensions on the ordinary plan have to be sustained; and we are disposed to put every trust in the estimates on this head of a gentleman of Mr. Hansom's great practical experience; but we foresee other advantages as likely to arise from his suspension plan of roofing, which would make the cost a matter of comparatively small moment. Buildings may be raised on this plan on a scale of magnitude, as well in respect of height as of area, which could not be erected at all on any other plan; and with greater height than has been ever before witnessed in our public buildings, with one

* *Referring to one exhibited in the Lecture Room.*

or two rare exceptions, we may ‹ to see a vast improvement in all architectural details to which hei auxiliary. Liability to fire will a greatly diminished by the general s tution of iron for wood in building say general substitution, for onc plied to roofing, that would inf lead the way to its adoption for staircases, doors, windows, &c., to which it is equally applicable.

To the Music Hall, both for it sake and for the sake of the new s of building likely to be identified w we cordially wish every possible su

MESSRS. RENNIE'S NEW ENGINE

Sir,—Your remarks on Messrs. Re engines seem to imply that the double der engine has been shelved in London as by its "Cornish patrons." Now this quite correct, as these engines have lon the staple manufacture of the Messrs. of Dartford, who besides furnishin French neighbours with a great numbe duly appreciate them on account of small consumption of fuel, can poi many of their erection in London a environs, as well as in different parts country. There is also the firm of M Easton and Amos, of the Grove, South who manufacture these engines to extent, and have many of them doing work exceedingly well in London a neighbourhood. I believe there are t 25-horse power each, of their constru at Battersea flour-mills, and, I am to beautifully does the last erected perform in the dark, you would not know she work, but for the breathing of the through the passages. Besides the there are doubtless other parties who struct this kind of engine, and therefo assumption "that the engineering wor been taken by surprise" by what is t the "re-production in the metropolis engine upon this principle, by engine eminence" must be incorrect.

With regard to the consumption of believe the Messrs. Hall guarantee per horse per hour; but 3lbs. I am gi understand is very seldom exceeded Easton and Amos's engines are equall cessful, I apprehend, in this particular

The Messrs. Rennie's engine is sai to consume more than 2·2lbs., but suf data to warrant such a conclusion hav yet appeared. The removal of three pro old crazy engines of the nominal pov sixty horses, is insufficient, as they we likely to perform more than thirty-

and from the difficulty of ascertaining
il amount of duty in consequence of
ture of the work on which they were
yed, I feel inclined, in the absence of
r particulars, to take the power ex-
by the new engine at 40 horses; di-
by which, the consumption of fuel
gree with that required by the engines
above experienced manufacturers, the
s. Hall, and Messrs. Easton and
.

: engines manufacted by the above
expand, I believe, only four times,
gives an advantage to the Messrs.
e, as their engine expands five; but
will depend upon the construction of
oiler employed by each party, as a dif-
e in that respect may give an advant-
ith so small a consumption as to cause
ation of perhaps 25 per cent.

ave taken occasion to remark long ago
: *Mechanics' Magazine*, and other pub-
ons, that though engines had attained
y high degree of perfection, boilers ge-
ly were still very rude, unsafe, inefficient,
without principle, either in construction,
application of heat, or the exposure of
water; and I am glad to see Mr. Wil-
has in your last Number also de-
ced the existing boiler practice in simi-
rms.

ave also urged in your pages, and else-
e, that the kind of engine in question
: only one by which the greatest possi-
ffect can be obtained, and therefore the
t for steam navigation—not, however,
steam exerts a greater power by expand-
in two cylinders, than it does in one,
because the use of two cylinders "equal-
' the power more nearly; that is to say,
duces the difference between the com-
cement and termination of the stroke to
aller amount than it is possible to effect
one cylinder, thus producing a more
ble motion, a more convenient and
ageable application of the principle, and
eby affording the means of carrying it out
e utmost profitable extent of which it is
ble, but which it has not yet attained.
is the advantage of employing two cy-
ers, though the Messrs. Rennie were of
ion, not long since, that there is no more
ntage in expanding in two cylinders than
e is in one. It seems, however, they
found reason to become converts, and
pe they will oblige us with the result of
experiments said to be in progress with
r new engine.

I remain, Sir,

Your most obedient servant,

ALPHA.

ehouse, March 28, 1842.

RECENT AMERICAN PATENTS.

[Selected and abridged from the *Franklin Journal.*]

IMPROVEMENT IN DRY DOCKS; *Charles F. Johnson.* This dock operates on the principle of those which raise the vessel by having inverted boxes under the cradle, into which air is introduced to exclude the water, and the patent is granted for a mode of preserving the equilibrium of the cradle and prevent rocking, which is effected either by means of vertical screws attached to each side of the cradle, and passing through nuts on each side of the dock, or by racks with ratchets into which palls work, or by ropes passing around pulleys attached to the sides of the cradle and dock.

LAYING VENEERS; *Casper Kittenger.* A board of any given length and width, to be governed by the size of the article to be veneered, passes through mortices made in two pieces of hard wood, one placed at each end. A mortice or slot is made in each of these pieces of wood, parallel with the one through which the board passes, to receive two rods of iron having a screw and nut on each end, to prevent them from falling out of the slot, but not screwed tight enough to prevent them from sliding along the length of the slots. To these rods is attached a band or sheet of iron, leather or cloth, reaching nearly the whole length, and hanging loose from one to the other, so as to form about a half cylinder. The board is provided with any given number of band screws, which pass through it and act upon the back of the article veneered, thus forcing the veneered surface against the band which adapts itself to the form of said surface. The claim is to the combination of the screws and bands, as described.

IMPROVEMENT IN THE MODE OF PACKING ROTARY STEAM ENGINES; *John D. Aikin.* This improvement is only for the packing of those parts which present two or three faces. The part to be packed is provided with a groove, into which the metallic packing is fitted. This packing consists of two metallic plates put together by halving the pieces where they meet, in the manner of a square-shouldered splice, and two screws, with conical ends, are employed to spread and force out the two halves, the conical end of each screw passing in between the end of one piece and the shoulder of the other; so that as the screws are advanced the packing will be forced out and spread endwise. This kind of packing is described as applied to the steam heads and sliding valves of a rotary steam engine. The claim is to the mode of packing "by means of the countersink, halved plates, and conical screws."

IMPROVEMENT IN SPRING SADDLES; *Orren M'Cluer.* The leather of the saddle-

seat, instead of being attached to the head of the tree, is attached to a spring which is fixed to the head of the tree, or to the straining web, which connects the spring and the back of the saddle. The skirts of the saddle lap over the covering of the seat sufficiently to allow the play of the spring, without allowing the edge of the covering of the seat to be drawn from under them. This arrangement allows full play to the spring without straining the covering of the seat.

MODE OF STRETCHING CLOTH IN THE PROCESS OF FULLING; *B. D. Whitney, and G. W. Lawton.* The cloth is carried round a series of rollers, one of which has its surface cut into a right and left-handed screw, each commencing in the middle and running out to the end. As this roller or double screw revolves with the cloth drawn over it, it will stretch the cloth widthwise. The same object is more effectually attained by making the surface of the roller in sections, sliding from the middle towards each end; the surface being seared or grooved so as to take hold of the cloth. The sections or segments project at each end beyond the body of the roller, and the part which projects is provided with a roller which fits into a spiral groove in a stationary cylindrical block at each end, and the grooves are so arranged that as the segments move round when they come to that part of their circuit in which they meet the cloth, (which is only in contact with a portion of the circumference,) the segments move outwards, stretching the cloth from the middle towards each edge, and when they leave the cloth they are drawn in.

IMPROVEMENT IN GRIST MILLS; *Edward Gray.* This improvement consists in placing a pair of small stones in the eye of the runner to prepare the grain before it passes to the large stones. The under one of the two small stones rests upon the driver of the large runner, and revolves with it, and the upper one is driven in the opposite direction by a driver attached to a small shaft, which takes the place of the damsel; its lower gudgeon working in the upper end of the main spindle. The grain is fed into the eye of the small upper stone, and after being partially ground, passes to the large stones to be ground into flour or meal. The defects in the common grist mill, which the patentee says he has overcome, are, "1st. The slowness of the grinding performed around the eye of the common stones, owing to the slow movement of the runner at this part of it, and the consequent insufficient supply of prepared grain for flouring, or being ground into flour, which is accomplished by the surfaces of the stones near the circumferences thereof, where the movement is quicker. And 2nd, the introduction of too much cool air between the stones through the eye of the runner."

IMPROVEMENT IN BREAST AND PITCH BACK WATER-WHEELS; *Edward Robbins, Jr., and William Ashby.* This improvement is designed to admit of the escape of the air which remains in the buckets after they have received the water from the flume, and allowing it to escape through openings in the sole or lining of the wheel, as the buckets, in their descent, are being immersed in the back, or tail race water. The buckets are either radial, or inclined to the radii, and do not reach the sole or lining of the wheel, but leave an open space between the two, which is closed by a flap either hinged to the back of the bucket, or turning on pivots in the shrouding, so as to operate as valves or shutters, the back or inner edge closing against the sole or inner lining directly above the hole made through it for the escape of the air in the bucket below. As the bucket descends, the back of the flap comes in contact with the water in the tail race, which opens it, and passes into the bucket following, forcing the air contained in the bucket, above the water, out through the hole in the sole or lining. Were it not for this arrangement, the patentee says the "air would be carried down, and be forced to descend with the buckets through the back water. This carrying down of the air, it must be manifest, would offer a considerable resistance to the motion of the wheel, and that it does so, is well known to us from most satisfactory experiments which we have made. What we claim, is the employment of valves in buckets of water-wheels, such valves having the position herein described, and being used in combination with the openings through the soling of the wheel, that is to say, said valves forming an angle of 130°, more or less, with the radiating buckets, or with radii of the wheel, and closing against its soling immediately above the opening, for the escape of air."

PREPARING WHITE LEAD PAINT; *James N. Trovillo.* This improvement consists in incorporating with a given quantity of white lead, equal, or nearly equal, quantities of linseed oil and of pure water, preparatory to grinding the paint, by first carefully incorporating the water and lead, and then adding the oil, and also in subsequently reducing it to a proper consistence by the addition of the same materials in the same proportions. The patentee says "I do not claim to be the first to have incorporated linseed oil and water together in the preparation of paint, with a view to economy in the use of the former article, this having been done by the

of lime or other alkaline substances; what I do claim is, the producing of combination by the agency of white . alone, substantially in the manner set h, for the purpose of producing a mixture to be employed as a paint applicable to the objects to which white lead paint is inarily applied."

IPROVEMENT IN STEAM BOILERS; *Jacob Eversole*. The patentee states, that the ect of his improvement is to prevent the oour, generated at the bottom of the ler, from coming in contact with the tom of the flue, and there forming a sheet, ich prevents the water from coming in itact with the heated metal. This he efts by means of a semi-cylindrical guard te of metal, which he places between the ttom of the flue and the bottom of the ller, and supports by legs or rods resting the latter. The steam that is generated the bottom of the boiler, in rising, comes contact with the bottom of the guard ite, which carries it up and prevents it m coming in contact with the bottom of : flue. It is evident, however, that the nedy will only be partial, for the steam which impinges upon the bottom of the guard plate, will soon elevate its temperature until it becomes nearly equal to that of the steam, and this will generate steam above the guard plate, which in rising, will impinge upon the bottom of the flue. The claim is confined to the placing of a guard plate between the flue and the bottom of the boiler.

IMPROVEMENTS IN MACHINERY FOR REMOVING STUMPS; *Miles C. Mix*. It would be useless to attempt to give a clear idea of this machine within the narrow limits of this notice, without drawings; suffice it to say, that the chain which is attached to the stump, and by which it is drawn up, is attached to a revolving shaft, on which it is wound as on a windlass, by means of a peculiarly arranged system of gearing, which facilitates the change of relative velocity between the point where the force is applied and the shaft on which the chain is wound. This shaft and gearing are placed in a frame provided with two wheels at one end, and a truck roller at the other, so arranged as to allow the ends of the frame to rest on the ground, that the whole may be attached or anchored for operation.

ST OF DESIGNS REGISTERED BETWEEN FEBRUARY 24TH, AND MARCH 24TH, 1842.

ate of Registration. 1842.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
b. 24	1106	R. Laidlow and Sons	Lamp	3 years.
"	1107	Henry Brinton	Carpet	1
25	1108	Albert Potter	Ditto	1
"	1109	John Thomas and G. Clarke	Ditto	1
"	1110	George Worley	Skeleton conductor for lamps	3
28	1111	James Yates	Stove	3
rch 2	1112	Wm. George Bentley	Projecting letters	3
3	1113	Wm. Hancock	Battledoor	1
4	1114	Joseph Hall	Drill harrow	3
7	1115	Southwells and Co.	Carpet	1
"	1116	John Knowles	Portable shower bath	3
9	1117	Charles Millard	Sofa	1
"	1118	Henry Fearncombe	Oblong coal-urn	3
"	1119,21	Wright and Crump	Carpet	1
10	1122	C. J. Redpath	Troops fire hearth	3
"	1123	Wm. Hancock, jun.	Nail	3
"	1124	Barlow and Cole	Carpet	1
11	1125	Albert Potter	Ditto	1
14	1126	Henderson and Co.	Ditto	1
15	1127	John Sheldon	Letter and coin balance and pencil and pen-case	3
"	1128	Henry Longden and Son	Stove	3
"	1829,37	J. and F. Kipling	Carpet	1
"	1138	Charles Dowse	Fire basket with boiler	3
"	1139	John Vernon	Screw clamp and plate for stereotype moulds	3
17	1140	W. Troubeck	Stained paper	1
"	1141,2	C. Meigh	Jug	1
18	1143	Davy Brothers	Inlaid cap for carriage wheels	1
"	1144	Mrs. Larbalestier	Shawl	3
21	1145	William Bridges Adams	Under side frame for railway carriages	1
"	1146	Joseph Schlesinger	Inkstand	3
"	1147	E. H. Bentall	Way pin for ploughs	3
22	1148	James Yates	Pier table	3
23	1149	J. and A. McNab	Fishing reel	3
24	1150	Alfred Leigh	Design for cutting, &c., tobacco, &c	3
"	1151,3	H. and J. Dixon	Carpet	1
"	1154	Henry N. E. McEvoy	Boot and shoe fastening	3
"	1155	*Sandes and Williams*	Harrow	3

[AGENTS FOR EFFECTING REGISTRATIONS, MESSRS. ROBERTSON AND CO., 166, FLEET-STREET.]

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 24TH OF FEBRUARY, A THE 23RD OF MARCH, 1842.

William Newton, of Chancery-lane, civil engineer, for certain improvements in regulating the flow of air and gaseous fluids. (Being a communication.) February 25; six months to specify.

Osborne Reynolds, of Belfast, Ireland, clerk, for certain improvements in covering streets, roads, and other ways with wood, and also in the means of enabling horses and other animals to pass over such roads and other slippery surfaces with greater safety than heretofore. February 25; six months.

John Birkby, of Upper Ramfold, York, card manufacturer, for improvements in the manufacture of wire cards. February 25; six months.

William Saunders, of Brighton, gentleman, for improvements in apparatus employed in roasting and baking animal food. February 25; six months.

Samuel Morand, of Manchester, merchant, for improvements in machinery or apparatus for stretching fabrics. February 26; six months.

Benjamin Gillot, of Great Saffron Hill, cutler, for improvements in heating and ventilating. February 26; six months.

Marc La Riviere, of London Fields, Hackney, gentleman, for certain improvements in the machinery for figure weaving in silk and other fabrics. March 1; six months.

Thomas Smith, of Northampton, plumber, for an improvement, or improvements in water-closets. March 1; six months.

George Carter Haseler, of Birmingham, jeweller and toy-maker, for improvements in the tops of scent bottles. March 3; six months.

Edward Slaughter, of Bristol, engineer, for improvements in the construction of iron wheels for railway and other carriages. March 4; six months.

James Clements, of Liverpool, manufacturer of toys, for improvements in composition for ornamenting glass and picture frames, and articles for interior and other decorations, also for the manufacture of toys and other fancy articles. March 4; six months.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the construction of candle lamps; March 4; six months.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in vessels for making infusions or decoctions, and for culinary purposes, and in apparatus for measuring or supplying from vessels. March 4; six months.

John Green, jun., of Newtown, Worcester, farmer, for certain improvements in machinery, or apparatus for cutting or reducing turnips, mangel wurzel, carrots, and other roots, for food for horned cattle, horses, and other animals. March 7; six months.

John George Bodmer, of Manchester, engineer, for certain improvements in machinery or apparatus for cleaning, carding, roving and spinning cotton and other fibrous substances. March 7; six months.

James Readman, of Islington, gentleman, for a certain improvement, or improvements, in the barometer. March 7; six months.

John Duncan, of Great George-street, gentleman, for improvements in machinery for excavating soil. (Being a communication.) March 7; six months.

John Warrick, of Laurence Pountney-lane, Cannon-street, merchant, for an apparatus called a "Gasoscope," and intended to show the presence of bi-carburetted hydrogen gas (the gas used for lighting) in mines, wells, houses, buildings, rooms, or vaults, and consequently, to prevent the explosion and accidents liable to be produced by the said gas. (Being a communication.) March 7; two months.

Francis Kane, of Cumberland-street, Middlesex Hospital, mechanic, for improvements in the construction of fastenings for the parts of bedsteads and other frames. March 7; six months.

Sir Francis Desanges, of Upper Seymour-street, *Portman-square, knight*, and Anguish Honour Augustus Durant, of Long Castle, Shropshi for improvements in apparatus for sweepi cleaning chimneys or flues, and extinguishi therein, which they intend to call "Ram March 7.

Robert Frampton, of Cleveland-street, l square, coach-maker, for improvements in t struction of hinges. March 7; six months.

Henry Barrow Rodway, of Birminghan wick, wine-merchant, for improvements in t nufacture of horse-shoes. March 7; six mo

Thomas Henry Russell, of Wednesbury, ir manufacturer, and Cornelius Whitehouse, same place, for improvements in the manu of welded iron tubing. March 7; six montl

William Newton, of Chancery-lane, civil er for an improved machine or apparatus for w various kinds of articles or goods. (Being munication.) March 7; six months.

Thomas Hedley, of Newcastle-upon-Tyne, man, and Cuthbert Rodham, of Gateshead, D for an improved apparatus for purifying the gases, and other noxious vapours arising fr tain fires, stoves, and furnaces. March months.

William Catford, of Chard, Somerset, me for certain improvements in machinery or ap for making or manufacturing lace or other fabrics. March 8; six months.

Henry Smith, of Liverpool, engineer, for ir ments in the construction of wheels and bre carriages. March 10; six months.

Richard Beard, of Earl-street, Blackfriars, man, for improvements in the means of ob likenesses and representations of nature other objects. March 10; six months.

William Edward Newton, of Chancery-lar engineer, for certain improvements in boile naces, and steam-engines. (Being a comm tion.) March 10; six months.

Charles William Firchild, of Wesley-park, field, Worcester, farmer, for an improved pr apparatus for marine and other purposes. 14; six months.

Reuben Partridge, of Cowper-street, Fi engineer, for certain improvements in mach apparatus for splitting and shaping wood into for the manufacture of matches, and other forms. March 14; six months.

Alfred Green, of Sheffield, surgical instr maker, for certain improvements in trusses gical bandages. March 15; six months.

Edwin Ward Trent, of Old Ford, flow maker, for an improved mode of preparing c and other fibrous substances, for caulking sh other vessels. March 21; six months.

Sydney Jessop, of Sheffield, merchant, for proved mode of preparing wrought-iron inten wheel-tires, rails, and certain other articles. 21; six months.

Zachariah Parkes, of Birmingham, manufa for certain improvements in apparatus for gi and dressing wheat and other grain. March months.

John Clay, of Cottingham, gentleman, an derick Rosenborg, of Sculcoates, York, gent for improvements in arranging and setting u for printing. March 21; six months.

William Hancock, the younger, of Amwell- gentleman, for certain improvements in com brushes. March 21: six months.

Edward John Dent, of the Strand, chrono maker, for certain improvements in chrono and other time-keepers. March 21; six mon

William Brockedon, of Queen-square, gent for improvements in manufacturing fibrous rials for the cores of stoppers, to be coate India-rubber, and used for stopping bottle other vessels. March 21; six months.

John Haughton, of Liverpool, clerk, for improvements in the method of affixing certain labels. March 21; six months.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the manufacture and preparation of pills, and some other articles of a medicinal or remedial nature. March 21; six months.

Mark Freeman, of Sutton-common, Surrey, gentleman, for improvements in the construction of inkstands. March 21; six months.

Robert Hazard, of Clifton, Somerset, confectioner, for improvements in apparatus for heating public and private buildings. March 21; six months.

Moses Sperry Beach, of Norfolk-street, Strand, printer, for improvements in machinery used for printing with type, and in the construction of type for printing. (Being a communication.) March 22; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND BETWEEN 22ND OF FEBRUARY, AND 22ND MARCH, 1842.

William Baker, of Grosvenor-street, Grosvenor-square, surgeon, for certain improvements in the manufacture of boots and shoes. Sealed February 22.

George Haden, of Trowbridge, engineer, for certain improvements in apparatus for warming and ventilating buildings. February 23.

Joseph Henry Tuck, of the New North-road, Hoxton, engineer, for improvements in apparatus or machinery for making or manufacturing candles. February 25.

Hugh Lee Pattinson, of Bensham-grove, Gateshead, manufacturing chemist, for improvements in the manufacture of white-lead, part of which improvements are applicable to the manufacture of magnesia and its salts. February 25.

Matthew Allen, of High Beech, Essex, doctor in medicine, for an improvement in producing uneven surfaces on wood. (Being a communication from abroad.) March 2.

Thomas Stopford Jones, of Stafford-place, Pimlico, gentleman, for certain improvements in machinery for propelling vessels by steam or other power. March 2.

Joseph Garnett, of Haslingden, county of Lancaster, dyer, and John Mason, of Rochdale, machine-maker, for certain improvements in machinery or apparatus employed in the manufacture of yarns and cloth; and are in possession of certain improvements applicable to the same. (Communicated from abroad.) March 8.

Joseph Drew, the younger, of St. Peter's Port, Island of Guernsey, confectioner, for an improved method of rolling and cutting lozenges; and also of cutting gun-wads and other similar substances, by means of a certain machine described by him, and constructed of divers metals and wood. March 7.

George Jarman, of Leeds, flax and cotton spinner, Robert Cook, of Hathersage, County of Derby, heckle and needle manufacturer, and Joshua Wordsworth, of Leeds, machine maker, for certain improvements in machinery for spinning flax, hemp, and tow. March 9.

James Ions, of Newcastle-upon-Tyne, gentleman, for improvements in smelting copper ores. March 10.

Julius Bordier, of Austin Friars, London, merchant, for certain improvements in preparing skins and hides, and converting them into leather. (Being a communication from abroad.) March 11.

Richard Laurence Sturtevant, of No. 42, Church-street, Bethnal Green, soap manufacturer, for certain improvements in the manufacture of soap. March 14.

William Hickling Burnett, of Ravensbourne Wood Mills, Deptford Creek, gentleman, for improvements in machinery for cutting wood, and in apparatus connected therewith, part of which may be applied to other purposes. March 14.

George Wildes, of Coleman-street, London, merchant, for improvements in the manufacture of white lead. (Being a communication from abroad.) March 16.

PATENTS GRANTED FOR IRELAND IN FEBRUARY, 1842.

Sam. Hall, for improvements in the combustion of fuel and smoke.

David Stead, for certain improvements in constructing, or paving of public streets and highways, public roads, courts, paths, bridges, cottages, and other houses with timber or wooden blocks, and in the machinery, or mode of manufacturing the said blocks.

James Ions, for improvements in smelting copper ores.

J. Border, for certain improvements in preparing skins and hides, and in converting them into leather

J. Steward, for certain improvements in the construction of pianofortes.

A. Templeton, for a new improved method of preparing for spinning silk and other fibrous substances

J. Coleman, for improvements in the manufacture of starch.

M. Macdonagh, for improvements in spindles, flyers and bobbins, for spinning, roving, twisting and reeling all sorts of fibrous or textile substances, and in the application, or adaptation of either, or all of them to machinery for the same purpose.

H. H. Watson, for certain improvements in dressing, stiffening and finishing cotton and other fibrous substances, and textile and other fabrics, part, or parts of which improvements are applicable to the manufacture of paper, and also to some of the processes or operations, connected with printing calicoes and other goods.

W. Palmer, for improvements in the manufacture of candles.

F. R. Conder, for improvements in the cutting and shaping of wood, and in the machinery used for that purpose.

NOTES AND NOTICES.

Fatal Steam-boat Accident on the Clyde.—The *Telegraph*, a passenger-boat worked on the high-pressure principle, has been blown up, and a great many persons killed and wounded. The *Greenock Observer* furnishes the following—rather lame—explanation of the cause of this melancholy disaster:—"On Tuesday the boiler was inspected by scientific gentlemen, who gave it decidedly as their opinion, that the accident occurred wholly from carelessness and inattention. The boiler shows by its appearance that it had been overheated. We understand that a regulator, attached to the engine and boiler, for the purpose of ascertaining the pressure, had gone wrong in the morning passage up to Glasgow, and it is supposed that this had prevented the engineer from knowing the amount of pressure. It is stated, likewise, that no steam was allowed to escape when she stopped at our quay, nor at Helensburgh. At low water, the boiler, &c., was sufficiently exposed to enable it to be examined to see in what state it was. The engineer, Mr. Rowland, who made the engine, caused an examination to be made, and he states the following to be the result of the investigation thus made:—'The accident has evidently been occasioned by the want of a due quantity of water in the boiler, as the plates in the crown (or cover) of the fire-box had been red-hot. On examination, we find the plates riven completely across; and the heat has been so great, that though

the fire-box (or furnace) is only about three feet three inches wide, the plates are stretched or expanded so as to measure four feet; and there are also on the plates several large blisters, which could only be the result of the intensity of the heat. The violence of the explosion has been so great, as to tear one of the corners of the fire-box a considerable way down, the plates at that corner being five-eighths of an inch thick. The same rent goes through a solid bar of iron, three inches by two. So far as can be seen, none of the tubes are injured. The fire-box was made of the best Lowmoor plate, of the following thickness:—Tube-plate, five-eighths of an inch; back, half an inch; crown, seven-sixteenths. Tube and back-plates welded.'" The names of the makers of the engines and boilers are not given; it seems only fair that they should be published. We should be glad to know, also, whether there are any boats on the Thames—whether of Clyde or Thames construction—now at work on the same *explosive* and *life-regardless* principle.

Archimedes and his Lever.—Quetelet, in his *Positions de Physique*, calculates that if the common centre of gravity of the earth and the moon be taken as the fulcrum of the lever with which Archimedes boasted he could move the world, the lever would require to be of such length as to extend amongst the fixed stars fifteen thousand millions of millions of times the distance of Saturn, Saturn's distance being three hundred millions of leagues; and that to have raised the earth one single foot, he would have had to act throughout a period of twenty-seven millions of millions of years, even supposing that he traversed the space requisite with the swiftness of a cannon-ball.

Miniatures on Marble.—Thin polished plates of white marble are now strongly recommended, by several French artists, as a substitute for ivory in miniature painting. The slices of marble are cemented down upon a sheet of board-paper, to prevent danger of fracture: they are said to take the colour with great freedom, and to hold it with tenacity; and it is obvious, that they are incapable of any change by time, or the effects of heat or damp. Ivory, it is well known, becomes yellow; and in hot climates often splits or warps. It can only be obtained, also, of a very limited size; whereas, these plates of the finest grained statuary marble can be obtained of any size. Plates of about 12 inches by 10 inches are prepared of only about three-sixteenths of an inch thick, and smaller ones thinner in proportion. Marble has been occasionally used, before now, as a plane for painting on *in oils*; but its application to miniature painting is certainly new, and seems valuable. —*Repertory of Patent Inventions.*

Inlaid Marbles.—A beautiful mode of ornamenting marbles has recently been brought into use in Paris:—It consists in etching, by acids, deeply into the marble, various designs upon a properly prepared bituminous ground. When the corrosion has gone sufficiently deep, the cavities are filled up with hard coloured wax, prepared so as to take a polish equal to that of the marble when cleared off. Drawings thus made on black marble, and filled in with scarlet wax, after the manner of Etruscan, and certain Egyptian designs, are said to have a very noble effect, and are applied to tables, panelling, stoves, &c., &c.—*Ibid.*

Continental Machinery.—We perceive in the *Eco della Borsa* of Milan, that extensive mills have been erected in Lombardy for spining of cotton and silk, and that there is now being added another on a very extensive scale, for spinning and weaving of flax and hemp. It is undertaken by a public company, at the head of which is S. Battaglia the banker. It is situate near Milan, on the Adda. We observe that the entire direction of projecting and executing this new concern was confided in 1840 to Mr. Albano, C.E., of London: it is stated to be the most complete mill in all its details that has ever been erected. The powerful water wheel, and the mill gear for driving the spinning machinery, are of a superior description, and were made in this country, by the celebrated firm of W. Fairbairn and Co., of Manchester. In consequence of the prohibitory character of our export laws, the spinning machinery is to be made in Belgium, although the Company was most desirous that it should be made in England. Here is another example of the ruinous effects being produced upon the country, through the absurd prohibitory laws. We thus see that an order of several thousand pounds is taken out of our hands. How long this is to last it is impossible to say.—*Civil Engineer and Architect's Journal.*

Thames Tunnel.—"The entire brickwork of the horizontal roadways, and the two shafts for the footway descents have, in the course of the last year, been safely completed. The entire brick structure, therefore, of the Tunnel, uniting the two opposite shores of the Thames, is now wholly completed, requiring only works of an ordinary character, to speedily adapt it for public use. The staircases of the two shafts for foot passengers have been contracted for by Messrs. Grissel and Peto, and will be completed in a few months, when the Tunnel will be forthwith opened to the public as a thoroughfare. The directors must express their satisfaction at the strong and durable character of the work, notwithstanding the trials it has undergone by the repeated irruptions of the river, and the loose and dangerous nature of the ground through which the work of excavation and of construction has been carried on. The brickwork remains perfectly solid and secure in all parts. Once erected under the protection of the shield, it has never given way in the slightest degree; nor has a step in advance, once gained, and secured by brickwork, ever had to be reconstructed, even though newly done and exposed to the utmost fury of the torrents of irruptions. The directors deem it their duty to state this, because it furnishes an explanation both of the cost and of the delay of the work.—*Report of Directors.*—[If not "a step in advance once gained and secured by brickwork has ever had to be reconstructed," how can this possibly account—as alleged—"*both* for the cost and the delay of the work!" The irruptions of the river may have caused delay; but the doubling and more of the cost can only have arisen from gross miscalculation.—Ed. M. M.]

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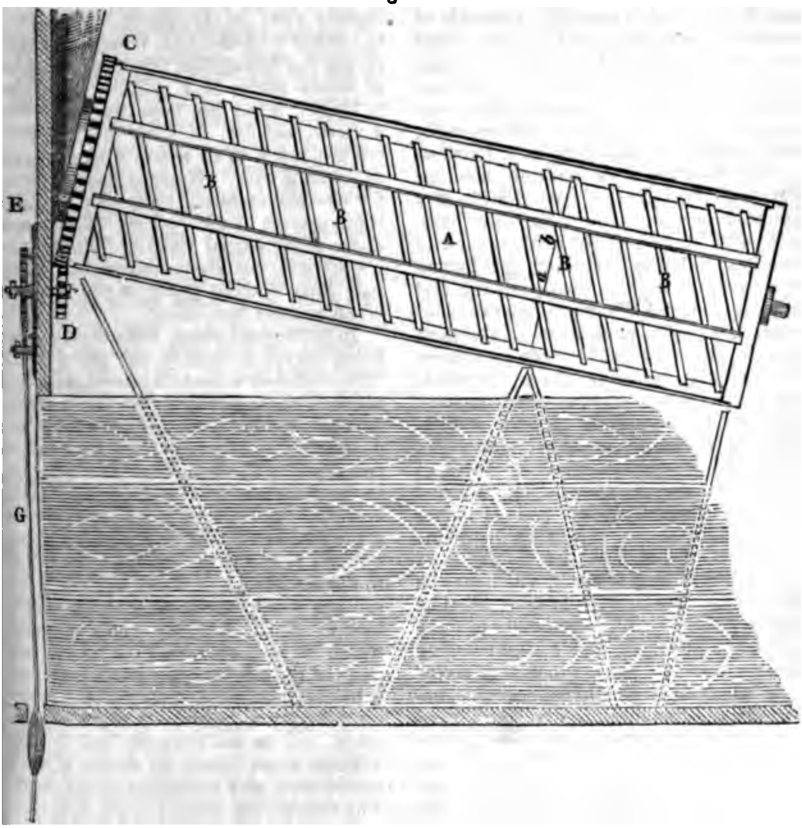
SCOTT'S PATENT FLOUR-DRESSING MACHINE.

Fig. 1.



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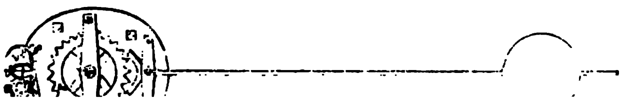


SCOTT'S PATENT FLOUR-DRESSING MACHINE.

[Patent dated September 23, 1841; Specification enrolled March 23, 1842.]

A bolting-mill, and a flour-dressing machine (as some of our readers may probably require to be informed) are two different things; the former being an article of some antiquity, while the latter is of modern invention, and has, to a great extent, superseded the other. The bolting-mill produces only two descriptions of meal, flour and pollard, or bran, while one flour-dressing machine is capable of producing as many different sorts, four five, or more, as may be required. Of old, it was necessary, when more than two varieties of fine and coarse flour were required, to have several bolting-mills, with cloth of various degrees of fineness.

The modern flour-dressing machine (in its most ordinary form) consists of a cylinder of hoops, or ribs, lined with wire-cloth, and a reel within it, armed with brushes; both cylinder and reel having one common axis, or shaft, but the reel only revolving, while the cylinder remains stationary. The extremities of the shaft rest in bearings in the ends of a large case, or box, which encloses the whole apparatus, but the bearings are at such different elevations as to give a considerable inclination to the cylinder. The wire-cloth is manufactured in pieces of 4 feet in length, to suit the internal diameter of the cylinder, and 9½ inches in breadth; so that supposing the cylinder to be 38 inches long it will take four pieces of cloth to line it, which may be of four different degrees of fineness. The first breadth of cloth is generally of sixty meshes to the inch, and a slight degree coarser than the next, which is of sixty-four—an arrangement found desirable, because when the meal is first introduced into the cylinder (from a feeding hopper above) it is still moist and warm from the stones, and would be apt to clog the meshes of the finer quality of cloth. The third and fourth pieces are of thirty-eight, and sixteen meshes to the inch. The bran which is too large to pass through any of the wires, passes out at the end of the machine. The part of the case below the cylinder is divided into the same number of compartments as there are pieces of wire-cloth of different degrees of fineness, each compartment being appropriated to the reception of the particular quality of flour pro-jected through the wire-cloth imı ly above it, by the rotary actioı brushes within the cylinder. Wl is the number, the different qual called firsts, seconds, thirds, and

Greatly superior as this mach the old bolting mill, it is not wi defects.

In the first place, the wire-clo rapidly away at the places whe in contact with the ribs, from th of the brushes against them, the of which places in a cylinder 3 in length, is not less than twelve a cloth becomes, in these plac for use, when in all others it is, as sound as ever. Hence a great for new cloth; hence, also, very interruptions to the working of chine from partial rents or failı endeavours, not always successfı pair them without going to the of an entirely new lining.

In the second place, from the being always stationary, the paı wire-cloth below the axis have a ı more work to perform than tho which is another source of uneqı and quantities of unexpelled floı and settle in the bottom of the to the great prejudice of its gene and efficiency. Many attempts l made to obviate this objection l a rotary action to the cylinder, ı to the brushes, and there are ı mills in which, at the present dı actually done; but the rates which it is proper to give to parts of the machine are so diffe it has been found a matter of tl est difficulty to proportion the o other, and in no instance has hitherto done, except by means complicated and cumbrous cont The brushes are usually made t at the rate of about four hundı in a minute; but the cylinder ı to revolve oftener than once or four minutes.

Both these defects are at len pletely remedied by the improved we are now about to describe—b certainly, of exceeding simplicity on that account the less merite the less likely to be efficient.

The first defect, Mr. Scott (o

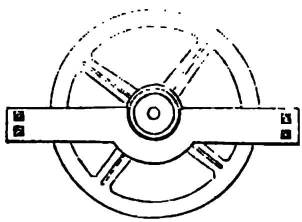
the patentee of the new machine, tells us, arises simply from fixing the ribs of the cylinder in *straight* lines, parallel to the top and bottom of the cylinder, or, in other words, at right angles to the axis of the cylinder. And who can doubt for a moment, (the thing being once pointed out) that he is right? Try to rend a piece of wire-cloth in the rectangular direction of the threads—nothing is easier; but try to rend it diagonally, or in a direction from corner to corner of the piece, and you will find that the thing is next to impossible. Behold, then, the obvious remedy. Mr. Scott places the ribs of his machine at such an angle (about 25°, as represented in the prefixed engraving, fig. 1) in respect to the threads, or meshes of the wire-cloth, that they shall be "more or less in the line of greatest resistance to tearing and rending."

"To prevent the angular position given to the ribs from diverting any of the finer or coarser portions of the flour into partitions other than those allotted to them, circular bands or plates of copper, or any other suitable material, as *a*, *b*, fig. 1, and of about the depth of the ribs, are inserted into the cylinder in positions parallel to the ends, and outside of the wire-cloth, at those places where such partings are desired to be made. Each piece of wire-cloth commencing with that at the top of the machine overlaps the one next below it; and to prevent the brushes from starting or raising the edges, and to keep these edges flat and even, each joining is covered with a strip of copper, or other suitable metal nailed over the cloth to the ribs."

The additions to the machine by which the second objection is got rid of, are also of admirable simplicity. We quote the ingenious inventor's own description.

"C C is a cog-wheel, or rather series of cogs affixed to the head of the cylinder A; D is a pinion which takes into the cog-wheel, or cogs C C; E is a plate fixed vertically to the head of the cylinder case, carrying the pinion D, and a pallet wheel F; G is a pendulum, the rod of which carries at its upper end two palls, which, as the pendulum vibrates, take alternately into the teeth of the pallet wheel. A separate view (as seen in front) of the additions E, F, and G, all of which, with the cogs C C, and pinion D, are peculiar to my said improved dressing machine, is given in fig. 2. The effect of imparting rotation to the cylinder, being of necessity to set in motion, all the gear work in connexion with the cogs C C; it follows also, that according to the relative proportions of the wheels and the weight and length of the pendulum, will be the rate at which the cylinder revolves. In order to lessen the friction of the cylinder in its rotation, the bearing at the tail end is made of the reduced size and form, represented in the plan, fig. 3."

Fig. 3.



Several machines of this improved description are already in use—one at Mr. Carpenter's Mills, Greenwich, which we have had an opportunity of seeing at work, and working to the perfect satisfaction of all concerned. We have no doubt, that in a short time this will be the only sort of flour-dressing machine in general use.

IMPERFECT BALANCING IN MACHINERY, A GREAT BUT NEGLECTED SOURCE OF LOSS OF POWER—THE CAUSE ALSO OF THE ROCKING AND JERKING MOTION COMMON TO LOCOMOTIVE ENGINES.

The *Midland Counties Herald* has contained lately some excellent reports of a series of lectures on Physical Mechanics, delivered by Dr. Melson at the Birmingham Philosophical Institution, and in every way deserving of being well reported. We have been much pleased with the sound and practical character of these lectures—the clearness of the lecturer's descriptions—the abundance and fitness of his illustrations—and the ability, as well as frequent originality of his suggestions. The sixth of these lectures was chiefly occupied with the exposition and enforcement of certain views on the friction arising from the imperfect balancing of machinery, first made public in the pages of this journal

by the ingenious Mr. George Heaton of Birmingham, whose persevering attempts to apply steam power to common road travelling must be fresh to the remembrance of our readers, as is also, we trust, the good sense and candour with which he ultimately abandoned them. Our Birmingham contemporary's report of this lecture we subjoin.

BIRMINGHAM PHILOSOPHICAL INSTITUTION.

Dr. Melson's Sixth Lecture on Physical Mechanics.

The great interest of this lecture consisted in the elaborate exposition which it contained of Mr. George Heaton's views of friction and balancing, illustrated as they were by numerous models which could not fail to convey to the minds of all present the most decided conviction of the truth of the statements which were made, and the important deductions derived from them. A lecture of more practical value, we are convinced, has seldom, if ever, been given within the walls of the institution; and the approbation manifested, as the lecture proceeded, by so many eminent machinists as were present, could not fail to be highly gratifying to Dr. Melson, and stimulative of his valuable exertions. The inclined plane, the wedge, and the screw, were first discussed, and their principles of equilibrium developed. After which, having made some preliminary observations on the roughness and extent of surface, the weight to be moved, the nature of bodies, velocity, and the kind of motion, as forming important elements in the consideration of friction, the lecturer observed, that proper width of bearing was essential in an economical point of view, as preventive of that rapid decay of machinery which must otherwise occur. In corroboration of this fact, an instance had been related to him some time ago, by Mr. Heaton, of the wheels of a locomotive engine working on a tram-way between Pontypool and Newport about ten years ago. These wheels were 4 feet in diameter, and only $\frac{7}{8}$ths of an inch in width on the face, and were made of cast iron. The consequence of such a narrow bearing was, that the wheels would, in a fortnight's regular work, wear away from 4 feet diameter to 3 feet 7 inches, being covered on their bearing surface with small loose particles of iron, in flakes similar in size and thickness to the scales of small fish, which was the general appearance wheels assumed when much trod away by friction. As it was of the greatest importance, in a practical point of view, to prevent friction as much as possible, Dr. Melson said he should offer no apology to the number of practical machinists, by whose presence he felt himself so much honoured, for presenting them with certain detailed observations which from time to time he had heard Mr. Heaton make, and in which he fully concurred. Friction, then, might be diminished by applying proper materials in the construction of axles, and the bearings on which they had to run; and by neglecting this important consideration the wear-and-tear in machinery might be indefinitely augmented. Nor was it enough to know, with reference to any individual article, as for instance of brass, that a spindle placed upon a bearing of brass was the best practical method of diminishing friction; but the quality of the brass itself was also an item of the greatest importance. Thus, let an iron spindle, having two necks or journals, carrying a wheel or other machinery giving a pressure of 200 lbs. upon every square inch of bearing surface on the journals, be made to rotate 200 times per minute, upon bearings of such brass as is used in the manufacture of pins, (soft brass,) and to be worked ten hours a-day, the necks of this spindle will require a lubricating material to be applied three times a-day, or oftener, and will, after all, require a new brass at the end of twelve months. If instead of the soft brass, the hard white button brass were used, half the lubricating material would suffice, and the bearings would last twice as long. If now the neck of the spindle were steeled and hardened, once a day would suffice for oiling the journals, and the brass bearings would last for five years; thus not only saving so much brass and oil, but the hard substances rubbing together, having less friction, would require less force to drive them. Dr. Melson here stated, and showed clearly, that although the neck of a spindle running upon a moveable bearing upon friction wheels had less friction, yet in practice these wheels were not so valuable as in theory they appeared to be. Not only was the spindle, in fact, rapidly trodden away, but by the springing of the iron or other material of which the friction-rollers and the spindle were made, although the resistance caused thereby was thought to be very minute, yet, in practice, when these cylindrical bodies were pressed together by a heavy weight, the resistance was very considerable, so much so that by the continual springing of the metal it might be shown that the spindle was, in point of fact, continually running up an inclined plane. Dr. Melson having shown how the wear-and-tear of friction wheels may be experimentallyillustrated, and how necessary it was for the contrivers of machinery to provide for the effects of friction, unless, indeed, they would have what seemed so per-

the form of models and drawings, t useless in the attempt to bring them tion, proceeded to the subject of *ng*. The position which he was pre- maintain at the outset of this part ubject was the following :—There is ong machinists sufficient care taken ruct all revolving machinery as nearly ble in balance. This would appear ore striking point of view to be of nce, when it was seen, as he was now d by models to prove, that inatten- balancing diminished according to a function of velocity, the power; and ed, in the second place, so much ive, dangerous, and at all times dis- le rocking and agitation in machinery. 'st, deficient balancing produced di- n of power. Here Dr. M. described ık, and particularly the double crank, connecting rod—stating its use in ing an alternate rising and falling into a rotary one, as in the locomo- ine, and *vice versâ*. He now took hand a model of a locomotive crank- nd showed how difficult it was to revolve above once or twice with test force he could exert upon it by ers. This done, he took up one similar, but having a counterpoise crank, and by the same force it per- with ease several revolutions. The next ran a rod of brass into the head ining capstan, and having placed the od so as to project equally on each the head, caused it to revolve by of a six-pound weight; it continued lve for 46 seconds, and performed in ie 241 revolutions, as read off on a . He next put the rod all out on le, and all other things being equal, revolved only 30 seconds, and per- only fifty revolutions. These expe- proved the position that inattention ıcing involves a decided loss of power. nents were next instituted to show ıder these circumstances an increase er may not only be thrown away, but ch an increase will absolutely tend to h the velocity. A three-pound weight a model out of balance to revolve and perform more revolutions than a ınd weight. This brought the lec- o his second position, viz., that de- of balancing will create a rocking and an agitation of the machinery will be greater or less as the want nce is greater or less. It was in the 810, whilst Mr. Heaton was employed be Abbey, by the late Earl of Craven, rt of his lordship's establishment kept amusement of himself and his visi- the practice of mechanical pursuits, as turning, sawing by circular saws, orna- menting by the aid of rose engines, &c., the covers of snuff boxes and other fancy ar- ticles, that, finding his hand power insuf- ficient, his lordship determined to have a small steam-engine erected of sufficient power to drive the lathe, &c., at the re- quisite speed. The engine having been put up, his lordship and many of his visitors were surprised to find that when one of the lathes was urged to a speed of about 600 revolutions in the minute it began to shake, and shook to such an extent as the speed was augmented as to raise the whole lathe and frame from the floor upon which it was placed. Mr. Heaton was, of course, con- sulted as to the cause of this agitation, and he attributed it unhesitatingly to the fact that the revolving parts of the machine, the pulleys, were not equal in weight on both sides of the centre. The lathe was of beau- tiful workmanship, made by one of the best makers in London, and the pulley suspected of the fault was made of rosewood, on which was fixed a dividing-plate. Now, it was probable that the texture of the wood being closer on one side than on the other when *dry*, was the cause of this inequality in the weight. Mr. Heaton had immediate instruc- tions to remedy this defect if possible, and he accomplished it in the following manner: —He bored a hole on the light side of the pulley 3½ inches from the centre, and intro- duced into it nine ounces of lead, which was the quantity required to make the pulley perfectly in balance. The lathe was now again set to work, and at a speed of 600 revolutions per minute, or any other speed requisite for its work, it was perfectly free from shaking. This rocking motion was now illustrated on a large model, whose axis was of the breadth of the ordinary railway gauge, and its two revolving rods of the length of the diameter of the wheels of a locomotive engine. Being unequally ba- lanced, and made to revolve by a weight of six pounds, it exemplified the rocking motion of the lathe. The same motion, Dr. M. observed, may also be noticed in some of the guide pulleys that are heavy-sided on the railways, where a rope is used to draw the train along, particularly when the train runs fast. Here several corrections of ma- chinery, both of lighter and more ponderous construction, were severally detailed, in which Mr. Heaton had succeeded, by at- tention to this principle, in producing an equable motion, where before the most vio- lent and unaccountable agitation had pre- vailed. One striking instance occurred in the latter part of last year; an application was made to the firm of Heaton Brothers, Shadwell-street, for instructions to rem-

the evil attendant upon the working of a fan used for the purpose of creating a blast for melting iron; this fan had been set to work, but the steam-engine by which it was driven was found incapable of getting it up to the required speed, which was about 1,000 revolutions per minute, and when it approached that speed it shook the whole of the buildings, and shook itself loose from its bearings. To obviate this position of affairs, the proprietors removed it into another position, and propped it with strong timbers, which strong timbers had their bearing under a heavy wall. When again set to work it shook the whole place as before, and made so much noise, that the proprietors were threatened with a prosecution for nuisance. At this critical juncture of affairs, Messrs. Heaton, having been consulted, immediately took the fan to pieces, and found it 2lbs. 8ozs. out of balance. The evil was rectified, and the fan restored to its former position, short of the whole of its props, &c. The engine was now set to work, and was found capable of driving the fan the requisite number of times, the nuisance was removed, and the fan had never since displayed any disposition to move from the place where it was set. Here an important observation was made, to the effect that the outside of the wings of this fan, which was three feet in diameter, when running at 1,000 turns per minute, does not travel quite twice as fast as the rim of the wheels of a railway train when the train is running at the speed of thirty miles an hour. The motion of the fan was now imitated on the large model, in which experiment the weights on the outside of the steel rods were not propelled at the rate of fifteen miles an hour, although the effect was so violent; whilst, at the same time, the weights travelled at a uniform speed in each part of their revolution. This was not the case with the wheels of a railway train; for if a train were travelling at the rate of thirty miles per hour, the top part of the wheels would, of course, have a much greater motion than the centre. If, then, such an effect were produced by the model, when only twelve ounces out of balance, and only moving that twelve ounces at the rate of fifteen miles per hour, what effects were we not prepared to expect from a railway wheel thrown forward at four times the speed, and where, as in many instances was the case, the wheels were each four times that much out of balance. Dr. Melson now exhibited a model of the locomotive crank shaft and wheels, one inch to the foot, and made it revolve; when the revolution of the wheels became rapid, it shook the board upon which it was placed with comparative violence, and rocked itself from one side of the box upon which the experiment was performed to the other. Next the cranks were counterpoised by weights placed opposite each crank in its nearest wheel, and the same velocity having been communicated to its revolutions, it revolved rapidly without the slightest perceptible agitation. Now, to show that it was not merely the increased momentum in the revolving wheels which gave the model this steadiness, Dr. Melson removed the counterpoises, and substituted larger weights in their place, and the first condition of agitation was produced even more powerfully than before. Similar, and equally convincing experiments were now performed on the large model. To show that these pitching and rocking motions were the identical motions communicated to railway trains, when running at a high velocity, and that the observations he had made were loudly called for by the circumstances attendant upon railway accidents, Dr. Melson now proceeded to give an elaborate series of references to the newspaper accounts of the inquests held on the bodies of the sufferers from the accidents which occurred on the Eastern Counties Railway, June, 1839, and August, 1840; and on the London and Brighton Railway, in October, 1841. From this evidence, it was seen that the rocking motion preceded in every instance the accident; that it was produced by augmented velocity; that the rails were perfect before the accident; that indications of lateral pressure were clear and unquestionable; that there is the same rocking on the Great Western Railway; that the opinions given by the different engineers fell short of the explication of the cause of the accident; and that many were, in short, opinions of little or no value; that there is a great difficulty, after all, in getting at the truth in these cases; and that one of the witnesses, in one case absolutely saw the engine leap up, and alight off the rails. The report of the officers of the railway department for 1842 was next as carefully examined, and it was found that the sentiments of Brunel, Professor Barlow, and Sir F. Smith, as therein embodied, went to confirm the evidence given at the several inquests, and to prove that the causes were yet doubtful which originated the oscillatory and pitching motions that preceded the accidents. The pages of the report particularly referred to were, 70, 71, 72, 76, 145, 191, 195, 203, &c. Immediately after the occurrence of the accident on the London and Brighton Railway, Mr. Heaton addressed to the *Times* the following letter, which, however, was never printed, and which has never yet been before the public.

"*Railway Accidents.*

[Ro]cking and Jumping of Locomotive "Engines.

"To the Editor of the *Times.*

[Sir,]—Seeing in your valuable publica[tion accou]nts of various accidents on the [railways,] I find in several instances the ac[cident ha]s been attributed to the engine [having ac]quired a rocking and jumping mo[tion, and]], in consequence, running off the [rails. To] prevent this, some of your cor[responden]ts advise the use of six-wheeled [engines,] such being by them considered [(though] in this I do not agree) than the [four-whee]led engines, and not so liable to [the rocki]ng and jumping motion. I think [the cause] of the complaint exists in some of [the six-], and as much in six-wheeled en[gines as] in four-wheeled ones; and that [by remov]ing the unevenness in weight of [the por]tions of the machinery—(I mean [the crank] shaft and appendages;) and con[sidering t]hat any arrangement of machinery [that woul]d secure steadiness of motion, and [render a]ccidents less frequent, would be of [public ut]ility, is my apology for troubling [you with] this communication.

[In t]he year 1831, myself and brothers [construct]ed a locomotive engine for the com[mon roa]d. We found, in our first experi[ments, wh]en we run the engines, (which were [of a shor]t stroke only,) at from 160 to 180 [strokes p]er minute, (which, by the arrange[ment of] our machinery we were enabled to [do,) the j]umping and rocking motion was so [great as t]o preclude the possibility of keep[ing our] seat upon the engine; being aware [that this] motion could only be produced by [the por]tions of our machinery being out [of balanc]e, we placed a compensating weight [opposite e]ach crank, and repeated our former [experime]nt upon the same road, and found [we obtain]ed greater speed with no greater [consump]tion of fuel; and the machine tra[velled pe]rfectly steady at any speed, and [without a]ny symptoms of rocking or [jumping.] Knowing that this same evil ex[isted in] locomotive engines on railways, I [construct]ed, in the summer of 1838, a model [of a cran]k-shaft and wheels of a locomotive [engine (to] a scale of 1 inch to the foot.) [In t]he month of October, in the same [year, I de]livered it into the possession of the [resi]dent engineer of the London and [Birmingh]am Railway, at Birmingham; a [descriptio]n of which was published in the [Mechanic]s' *Magazine* of April, 1839, of [which th]e following is a copy:—

'*[Rocking] and Oscillating Motion of Locomotive Engines.*

'[M]y *attention having been drawn to the shaking motion of engines upon rail[ways, and b]elieving it to be in proportion to the* weight of the cranks and gearing, and the position in which the outside cranks, if any, are placed, I made a small model of the engine-crank shaft, with two wheels upon it, in the proportion of 1 inch to the foot, which I placed upon two strong upright wires, the wires having been made fast in a piece of board. I attached a weight to a string wrapped round the middle of the crank shaft, for the purpose of giving a certain degree of velocity to the crank and wheels, by falling a certain distance, and then being released, say from the table to the floor. The momentum or speed thus attained was sufficient to keep the crank shaft and wheels in motion seventy-five seconds, and the swing of the cranks produced a lateral and oscillating motion sufficient to cause the model to move, or jump across the table upon which it was placed. I then placed a weight on each wheel sufficient to balance the crank, and with the same weight to give motion, and travelling the same distance as in the first case, gave sufficient momentum to keep the crank shaft and wheels, although heavier than before, ninety seconds, and the model stood steady where it was placed upon the table.

'I submitted my experiments to the engineers of the London and Birmingham Railway, who, instructed by the directors, ordered one of the company's engines, (the Brockhall, at that time under repair at Mr. Middleton's, the Vulcan Iron Foundry, Birmingham) to have balance weights applied to it, according to my plans, and under my superintendence. The engine, when set to work with balance weights upon the wheels* had one uniform steady pull at its work; the side sway was gone; it ran equally steady, whether it made 6 or 160 strokes per minute, which is not the case with railway engines generally, for the greater the speed, the greater the snatching and swinging motion. After the engine had worked seven weeks, and had acquired the reputation of a very steady engine, I, with the consent of the engineers of the railway, removed the balance weights from the wheels, and found the same snatching and swinging motion with this engine as is common to all locomotive engines of the usual construction. I found that the engine, when running at or upwards of twenty-two miles per hour, would advance and recede from and to the tender from three-quarters of an inch to an inch every stroke of the engine, and proved the advantage of the balance on the engine equal to the effect on the model. Persons acquainted with railway locomotives will, from the foregoing statements, readily see the great and many advantages to be derived from so simple and yet so effective an arrangement.—Yours, respectfully,

'GEORGE HEATON.

'Shadwell-street Mills, Birmingham.'

"Since that time, some of the most celebrated manufacturers of locomotive engines have added to their engines balance weights, fixed in the wheels in so neat a manner as scarcely to be noticed, particularly by persons not much acquainted with this description of machinery. Whether the engine which caused the accident on the Brighton Railway, or the one that made the rails into the form of a snake on the Eastern Counties Railway some time ago, had balance weights or not, I do not know, but from the description of the accidents, as given in your publication at the time, I should say they had not. Why locomotive engines should continue to be made, and used, (and I know

"* Weighing one hundred and eighty-four pounds, fixed 22 inches from the centre."

they are,) without paying particular attention to this subject, is a matter of surprise to me, when the cost of the necessary appendages to balance the cranks, connecting rods, &c., would not, in the manufacture of a new engine, exceed forty shillings. Why this important feature in mechanics should be neglected by railway engineers is astonishing, as it must be known to them that it is particularly attended to in all other kinds of machinery; and even by themselves, when turning these same cranks for the locomotive engines in the lathe, at their manufactory, a balanced weight is used to make them run steady during the operation. To further illustrate the necessity of great care in this department of the science of mechanics, I will instance the simple machine used for the purpose of grinding the points of pins: this is composed of two discs or pieces of steel, about 6 inches diameter, and weighing about 12 pounds each; they are fixed upon a thin spindle or shaft, and require to be propelled round at about 3,500 times per minute. These mills or discs are always set out of truth with each other, but require to balance each other so nicely, to determine their resting steady in their journals, that one-twentieth part of an ounce out of balance with each other would render the machine unsafe to the workman, being liable to jump from its bearings, and unfit for use. The outside of the discs (or 'mills,' as they are called by the workmen) travel but little more (if so much at times) than double the speed of the locomotive engines—say 5,250 feet per minute, or nearly sixty miles per hour. The cranks of locomotive engines (with wheels of 5 feet diameter, and stroke of piston 18 inches) travel, when conveying a mail train, at about one-sixth, and sometimes at about one-fifth, of the speed of the outside of the pin mill, and are about (including the connecting rods, brasses, cutters, &c.) one hundred and eighty pounds out of balance, and, when the train is going at the rate of thirty miles per hour, has to swing round from 180 to 200 times per minute: these cranks being at right angles, and some distance from the axis of the engine, one on one side and the other on the contrary side of the axis, swinging round at such a pace, is, in my opinion, the cause of the rocking motion. The engine running for some time at one uniform speed, and at a high velocity, the springs are acted upon by the unevenness or swinging of the cranks, connecting rods, &c., until the springs and cranks keep time with each other, when the jumping motion commences, and at every stroke of the engine is increased to a great extent, and if the speed cannot be immediately seriously altered, (which is found impossible with a heavy train,) the engine will, in spite of all other efforts to prevent it, jump off the rails.

"Yours respectfully,

"GEORGE HEATON.

"Shadwell-street Mills, Birmingham,
October 23, 1841."

Dr. Melson concluded by referring to the fact that the compensation principle was already beginning to gain much upon public favour; that on the Birmingham and Manchester (Crewe) Line such engines were universally adopted, and that on several of the lines there were individual engines of this character. The straight-axled engine is decidedly superior to the other, but here the evil obtains, inasmuch as the crank-pins and connecting rods are not compensated.

NEW STEAM FRIGATE—THE LARGEST IN THE WORLD.

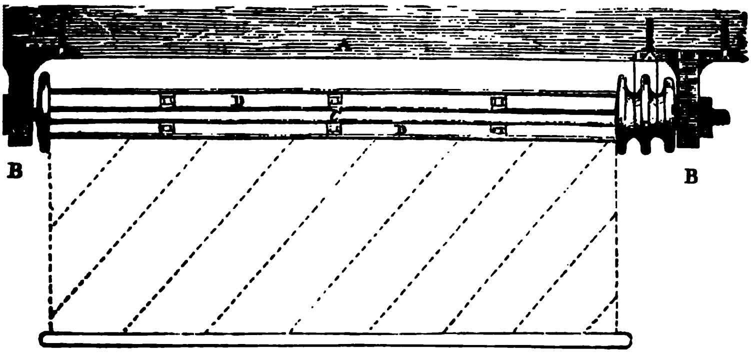
The Admiralty have given instructions for the building and equipment of a new steam frigate, which is to surpass, in size and power, every thing of the kind yet afloat. She is to be of 650 horses power; to have engine room for 600 tons of fuel; complete stowage under hatches for one thousand troops, with four months' stores and provisions, exclusive of a crew of about four hundred and fifty men; and is to be armed with twenty guns of the heaviest calibre, besides carronades. The *Cyclops*, *Gorgon*, *Geyser*, and other war steamers now talked of as wonders for magnitude, will sink into insignificance as compared with this; the largest of them will be little more than half her size. For the sake of greater expedition she is to be made out of one of the large class frigates lately built (the *Penelope*, cut into two, with 55 feet in length 44) added. The originator of this plan is John Edye, Esq., the able assistant surveyor of the Navy, (well known to all naval architects for his invaluable work on the "Equipment, Displacement, &c., of Ships, and Vessels of War") and she is to be completed at Chatham Dockyard, under his immediate superintendence and direction. The engines are to be on the Gorgon plan, and the commission for building them has been given to the inventors of that plan, Messrs. John and Samuel Seaward. The vessel is expected to be fully completed, and ready for sea before the close of the present year.

The conduct of the Government in

atter—conduct alike admirable for ur and promptitude, is—under the g circumstances of the country, iture to give very general satisfac- By nothing can such disasters as itely befallen our arms in the East ffectually repaired, or their recur- more certainly prevented, than by ting out of a few such leviathans , as that which we have now de- l as being in progress. With half n ships of this force at command— men might within three weeks he first receipt of the news from inistan, have been landed at Alex- —marched in six days through (with leave of its Viceroy,) to r, on the Red Sea—and transported in nine days more to Kurruckee e south coast of Scinde. With a force there is hardly a corner world which British thunder could ach in early time enough to uphold, t all opposition, British influence when linked in honourable alliance with the interests of human civilization and happiness (may we never know any other!) It is, moreover, a simple mechanical fact, which admits of no denial, that Great Britain can show forth a power in this way (thanks to her mechanics! thanks to her workshops! thanks to her *practical* science!) which no other country in the world can at all approach, far less rival. Every year, for the last half dozen, has witnessed some *paper* decree for the formation of a French steam navy, with engines of 300, 400 and 500 horse power, but where are they? It is notorious, that *all France* has never yet been able to produce an engine, good for anything, of more than 200 horses power. Were such an order, as has been just given by our Admiralty for a pair of 325 horses power each, to be furnished in nine months, to be given by the French government to French manufacturers, it could not be executed (if at all) in as many years.

WHEELER'S IMPROVED ROLLER FOR WINDOW-BLINDS.

(Registered pursuant to Act of Parliament, April 4, 1842.)



e novelty in this roller consists in eing constructed of such materials, n such manner, that it may be of length required, without being er than one of the common width, without its being liable to bend or in the centre. It is particularly able, therefore, to very large win- , such as those of shops, churches, &c. The prefixed drawing is a sentation of one of no less than 20 in length, which has been fitted by inventor (*Mr. Charles Wheeler, of ...ham..., Newbury*) *to the shop- w of an extensive draper.* The construction will be readily understood from the following description.

A is the brestsummer.

B B two strong brackets secured to the brestsummer.

C is a ¾-inch iron pipe, enclosed in a cylinder, D, and resting by its extremities in the brackets, B B, the parts outside of the brackets being screwed for the reception of two strong nuts.

D, the outer cylinder, may be made of wood, or tin, or any other suitable light material; and between it and the iron pipe vertical stays are placed at intervals, (as represented in the engraving,) for

the sake of greater support and security. At one end are two pulleys, by which the blind is raised and lowered, by means of lines passing from them under the cornice, down to a windlass in the inside of the shop.

By screwing tight the nuts on the ends of the iron pipe, C, that pipe can always be kept in a perfectly horizontal position; and as long as it remains so, the wooden, or tin cylinder which incloses it, and on which the blind is wound, will remain equally so.

When the blind is entirely up, the whole apparatus is concealed from view by a face-board (not shown in the drawing) which may be made of any suitable ornamental form.

HINTS ON VALVES—MESSRS. MAUDSLAYS AND FIELD'S PRACTICE.

The quantity of lap or cover proper to be put upon valves, is a question determinable altogether by the quantity of expansion required, and varies in different engines of the same power. But the upper and under faces of the valve are, in Messrs. Maudslays' (side lever) engines, in no case of the same breadth: the cause for this inequality is that if the valve be at half stroke, that is, with both ports closed, and if the engine be moved round, the travel of the valve from half stroke to the extremity of the stroke *downwards* will be found to be not the same as the travel of the valve from half stroke to the extremity of the stroke *upwards*. In other words, the space described by the valve whilst the piston descends, and the space described by the valve whilst the piston ascends, *are not equal;* whereby it becomes necessary to make the superior and inferior faces of the valves of different depths, to compensate for this inequality. The accuracy of the preceding statement every engineer has it in his power to verify, either by a model, or by a drawing of the valve and piston in their several relative positions. The cause of the irregularity may be traced to the oblique action of the connecting and eccentric rods. If the piston be placed at half stroke, that is, midway between the top and the bottom of the cylinder, the crank will not be level. This is manifest from the ordinary method of ascertaining the length of the connecting rod, which is to level the beams, and take the vertical distance from the extremity of the beams to the centre of the crank shaft. When the beams are level the engine is at half stroke, but if we wish to attach the connecting rod to the crank pin—its length being ascertained as above—it will be necessary to bring the crank down a little, to compensate for the depression of the head of the connecting rod due to the deviation from the vertical line. If, then, the crank be not level at half stroke, the descent of the piston from half stroke, and its ascent to half stroke again will accomplish *more* than half a revolution of the paddle wheels; and the ascent of the piston from half stroke, and its descent to half stroke again, will accomplish *less* than half a revolution of the paddle wheels. The ratio of the disparity will vary with the length of the connecting rod, the circumstance of there being overhang or no overhang of the beam, the length of the beam, and other circumstances; but in all ordinary engines, the difference between the upper segment of the circle of the crank's revolution and the under segment of that circle will interfere with the valve's motion, and the proportionment of the valve faces ought to have reference to the extent of that interference.

It is Messrs. Maudslays' practice in some of their very recent engines, to make the stroke of the valve considerably more than twice the depth of the port. All the valve levers are equal, and the stroke of the valves is in all cases equal to the throw of the eccentric. It is also their invariable practice, in all engines of considerable magnitude, to construct the valve casing with a faucet joint, to permit the expansion of the casing when heated with steam, without distorting the cylinder. In some large engines which have been without this provision, we have known the cylinder ports to be rent asunder by the expansion of the casing; and however frequently and however well the rust joints of the casing might have been made, they invariably became very soon leaky, from the effect of unequal expansion. The cylinder when hot will expand as much as the valve casing; and if the two were always equally heated, no detriment could ensue from the absence of an expansion joint. But as the throttle valve is never perfectly tight, and as the slide valve generally is so, the steam before the engines are started enters the casing and induces its expansion; whilst being excluded by the slide valve from the cylinder, the cylinder is not heated, and therefore does not expand. Injury of some sort or other, if the engine be large, is sure to be the result of these conflicting forces.

In the double cylinder engines of Messrs. Maudslays, cylindrical slide valves are employed, and have been found to operate extremely well. The packing of these valves is metallic. The packing of the pistons made

firm are invariably metallic, consist of a single ring turned in one place, and the cut part tongue piece to prevent the passing through the cut. A e breadth as the ring is fitted of the cut, ground tight, and to one part of the ring. The he ring is in most cases found eep the ring in intimate con- interior of the cylinder, and which this contact is main- e either augmented or dimin- ridle. — *Civil Engineer and ournal.*

'S HYDRAULIC ENGINE.

sorry that the use of the term he description of "Walker's gine," in No. 971, should have correspondent, "A Builder;" referred to my previous com- n this subject, I think this e happened, and therefore I gle in this misconception: in g for himself has put all right. nce to the omission charged ecting the very ingenious valve alker has adapted to his ma- ology is twofold. Firstly, I f calling the attention of your y to the general principle of without any reference to con- ls; because, as the thing is point of view) in its infancy, gs forth some improvement in the mechanism. And, second- ement in question did not ex- my paper was written.

g interest is, as "A Builder" ly interested in this invention. er has to be raised under cir- ich produce a liability in ordi- o choke, or to wear rapidly, machine can be employed with dvantage.

ontaining large quantities of , this is the only *elevator* that r a continuance.

has already been applied to to raise some sandy water bled the best pumps that could n an hour; and the failure of that has hitherto been tried onderful" included) has com- pension of the work. There it Mr. Walker's machine will mnt this difficulty, and enable h is of the first importance e world) to be completed ther delay.

From what has been already accomplished, it seems pretty evident that wherever ordinary pumps can work, Mr. Walker's machine will beat them in the quantity of work done with a given power; and that under circumstances rapidly destructive to all other machines, that of Mr. Walker will continue to perform its functions uninjured for an indefinite period. I remain, Sir,

Yours respectfully,
WM. BADDELEY.

29, Alfred-street, Islington,
April 4, 1842.

MERITON'S SLIDE-VALVES.

Sir,—My attention has been drawn to a letter which appeared in your Magazine of the 19th of March, written by Mr. T. Meriton, of MillWall, and accompanied with five views of an improved slide-valve.

The advantage of this valve is stated to consist in giving steam quicker than the common D valve; and this we may perhaps allow, providing it can be first shown that it will answer at all. The slides, he says, would only require to travel $\frac{1}{10}$th part of the distance of the D valve (still sticking to the same valve) but I would remind Mr. Meriton that there are other sorts of valves beside the D valves, which would also require only $\frac{1}{10}$th of their travel, such as double beat, or equilibrium valves.

We are further told, (and to this point I would direct the special attention of your readers) that it does "away with a deal of work, such as the D valve, jacket packing, blocks, &c." Now, in the first place, it must appear evident to any person who looks candidly into the matter, that, to keep a ring steady, such as Mr. M. intends to make use of for a slide, there must be at least three valve-spindles at the top, and three at the bottom, so that we should have not less than seven steam-tight stuffing-boxes immediately connected with the cylinder! Every engineer knows that the D valve, together with the cylinder, would only require two. Then again, there is the labour and expense of casting a cylinder with four small passages round it; indeed, I feel rather doubtful whether it would be possible to do it. So much for the dispensing with "a *deal* of work!"

But what surprises me most is the blunder which Mr. M. has made in his intended application of a metallic ring for a slide. This ring, from Mr. M.'s explanation, I understand to be one of cast iron, or brass, turned true, inside and out, with one side thinner than the other, so that when it is cut in two at the thinnest side, it has a tendency to fly open, and press with its rim against the sides of

the cylinder. It appears to be on the same principle exactly as the piston-rings now pretty generally adopted by engineers. Now it is evident that if a ring of this description be applied to the ports in Mr. M.'s cylinder (and your readers will oblige me if they will just turn to that gentleman's sketches) the steam will act continually against its rim, and force the two thin ends close together; which must consequently make the ring less in diameter than the bore of the cylinder, and admit the steam, whether it be required or not. I am, Sir,

Yours, &c.,

D.

ON PARACHUTES.—BY THE LATE BARON MASSERES.

(From the MS. collections of the late Dr. Olinthus Gregory.)

1. If a cylinder of lead, or wood, or any other substance heavier than air, falls perpendicularly downwards through the air with its base, or flat side, foremost, or so that its axis shall always be perpendicular to the horizon, and the number of inches in the axis or height of the cylinder be denoted by the letter a, and p be the number which bears the same proportion to 1 as the specific gravity of the cylinder bears to the specific gravity of air, the greatest velocity which the cylinder can acquire by falling in this manner through the air will be such as will carry it through $\sqrt{384\,pa}$ inches in a second of time. This I have seen demonstrated.

2. As an example of this, let the height of the cylinder be 3 inches, and its specific gravity the same as that of water, or 860 times the specific gravity of air. Then we shall have $a = 3$, and $pa\ (= 860 \times 3) = 2580$, and $384\,pa\ (= 384 \times 2580) = 990,720$, and consequently $\sqrt{384\,pa}\ (= \sqrt{990,720}) = 995$ inches. Therefore the greatest velocity that can be acquired by such a cylinder in falling in this manner through the air is that of 995 inches, or about 83 feet, in a second of time.

If such a cylinder were 10 feet broad, or the diameter of its base was 10 feet, or 120 inches, the number of cubic inches contained in it would be $\left(3 \times 120 \times \frac{11}{14} = 3 \times 14400 \times \frac{11}{14} = 43200 \times \frac{11}{14} = \frac{475,200}{14}\right) = 33,943.$

Now every cubic foot of wat[er weighs] 62 pounds and a half, avoirdup[ois; there]fore every cubic inch of wate[r weighs]

$$\left(\frac{62\cdot5}{12 \times 12 \times 12} = \frac{62\cdot5}{1728} = \right)$$

a pound avoirdupois. Therefor[e ...] cubic inches of water will weig[h ...] $\times\ 0\cdot0361 =$) 1225 pounds. [...] a cylinder, or parachute, of the [same spe]cific gravity as water, and of 1[0 feet dia]meter in the base, and 3 inches [in height] or thickness, would weigh 122[5 pounds.] Box wood is heavier than wa[ter in the] proportion of 103 to 100. Th[erefore a] cylinder, or parachute, made of [box wood] whose height, or thickness, [...] inches, and the diameter of [...] 10 feet, or 120 inches, wou[ld weigh]

$$\left(1225 \times \frac{103}{100} \text{ or } \right) 1262$$

And as the difference of thi[s specific] gravity from that of water is [...] the utmost velocity which such [a cylin]der, or parachute, could acqui[re by fall]ing in the above described [manner] through the air would be but l[ittle more] than that of the former para[chute, or] than that of 83 feet in a [second of] time. Now let us suppose the [height of] this parachute of box wood to b[e reduced] from 3 inches to $\frac{1}{2}$ an inch, [or to $\frac{1}{6}$ of] what it was before. Then it [...] that $\sqrt{384\,pa}$ will be less th[an it was] before in the proportion of 1 t[o ...] or of 1 to 2·44, and consequent[ly ...]

$$\left(= 83 + \frac{1}{2\cdot44} \text{ or } \right) 34$$

second of time. And the weig[ht of this] last parachute will be $\frac{1}{6}$th of t[hat] of the former, or $\left(\frac{1262}{6}\right.$ or [...] pounds.

Now let the diameter of the [parachute] be enlarged from 10 feet to 40 [...] its height at the same time d[iminished] from $\frac{1}{2}$ an inch to the 32nd [part of an] inch. Then it is evident tha[t its] contents, and consequently it[s weight,] will continue the same; becau[se its base] will be increased in the same [proportion] of 16 to 1 in which its height [is dimi]nished. It will, therefore, s[till weigh] 210 pounds. But the utmos[t velocity] which it can acquire by fallin[g through] the air, in the manner above

less than before in the proportion 4, and therefore will be that of

or) 8¼ feet in a second of

herefore, a parachute can be of the diameter of 40 feet and ery small thickness, so that its together with that of a man from it, shall be only 210 the utmost velocity such a para- nd the man hanging from it, can by falling through the air in the above-described, is that of 8¼ a second of time, or about 5¼ an hour.

CTS OF SPECIFICATIONS OF ENGLISH TENTS RECENTLY ENROLLED.

LACHENAL, OF TICHFIELD-STREET, ECHANIC, AND ANTOINE VIEYRES, 40, PALL-MALL, WATCH-MAKER, *rovements in machinery for cutting* Enrolment Office, March 4, 1842.

separate and distinct machines are d for this purpose, driven by a steam- or other suitable power. The first cuts the slabs of cork by means of g cutters into perfect parallelograms; hine being so far self-adjusting as to self to the thickness of the slab what- t may happen to be. The upper der bark, or surface of the cork moved, the parallelograms are fed square tube to the other or rounding . On reaching the bottom of the e square pieces of cork enter into formed round the periphery of a g wheel which regulates their ad- to the holders; these holders seize llelograms of cork between them, and ring, present them to fixed knives, by ey are cut into the shape requisite for n order to preserve the fine edge ne- for cutting cork, revolving rubbers, s of which are mounted on springs, t in contact with the cutting edges nives or cutters. These rubbers are d of copper or other suitable mate- to the face of which, fine diamond has been driven, by hammering.

nventors of this machinery have be- a great deal of ingenuity and pains , but on the whole, we see no reason ve that they have succeeded much han others in overcoming the *econo-* fficulties which seem inseparable from npts at cork-cutting by machinery. The cunning of the hand will still, we suspect, maintain its ancient mastery in this, as it has done in various other arts, to which machinery has been able to lend no assistance, for this simple reason, that the hand is itself a machine, surpassed by few in capacity and power. The method by which the present patentees propose to keep their cutters in constant working order is not new, the same having been before proposed by an American patentee (see *Mech. Mag.* vol. xxxvi. p. 127) for though the American cork-cutter makes no mention of the diamond powder—as never dreaming probably that it would answer to grind down diamonds to make corks—he claims "the use of emery *or any other substance* which will give an edge."

JOHN JUCKES OF LEWISHAM, KENT, *for improvements in furnaces or fire-places.*—Enrolment Office, March 4, 1842.

An endless chain of moveable furnace bars passes round two wheels, one at the front of the furnace and the other at the back; and this chain is made to revolve at the rate of about three feet an hour, by means of sundry rollers, cog-wheels, pinions, levers, ratchets, clicks, rails, &c., the fresh supplies of fuel being dropped upon the bars from a hopper over the mouth of the furnace, and carried slowly forward into the burning mass, as the chain revolves. The action of the apparatus is precisely similar to that of the well-known dredging machine.

The patentee says, "I wish it to be understood, that what I claim is the mode of constructing furnaces or fire-places by combining fire-bars into a chain, by which the parts may be changed in their position from time to time, and progressively go into and out of action as above explained."

We do not think the patentee runs much risk of his claim being invaded. His apparatus is simply the most complicated and cumbrous of all which have yet been invented, whether for the better protection of fire-bars, or better consumption of fuel; and is of a great deal less promise in point of efficiency, than many others that might be named. Brunton's well known revolving grate, for example, the patent for which has long since expired, and which all the world therefore are now free to use, and may in many cases use with great advantage.

MICHAEL COUPLAND, OF POND YARD, SOUTHWARK, MILL WRIGHT AND ENGINEER, *for improvements in furnaces.* Enrolment Office, March 4, 1842.

Half of the fire-bars are made capable of being lowered and raised by means of an auxiliary apparatus of wheels, screws, &c. alternating with other bars, which lift upwards only, so that fresh supplies of fuel

may be placed on the lowered bars as wanted, and raised into the furnace *below* the ignited fuel.

The claim is confined to the method of feeding furnaces from *below*, by lowering only "*a portion* of the fire-bars;" and rightly so, for a method of doing the same thing by the lowering of the whole of the fire-bars has been already patented (E. Foard, Islington, Jan. 16, 1841,)—a method, too, which is much simpler than that of the present patentee. If a deviation to the extent of one-half be sustainable, why not also one to the extent of a fourth or a tenth, or a hundredth, or a thousandth part of an invention? And where then might a patentee's right be said to *begin?*

JOSEPH MILLER, OF MONASTERY COLLEGE, EAST INDIA ROAD, ENGINEER, *for an improved arrangement and combination of certain parts of steam-engines used for steam navigation.* Rolls Chapel, March 29, 1842.

The "improved arrangement and combination" which form the subject of this patent, apply chiefly to that class of marine steam-engines, in which two steam cylinders, two condensers, and two air pumps are employed; and have for their principal objects saving of space, increased length of stroke, greater stability, &c.

The patentee describes thus generally his invention:—"The improved arrangement and construction consist in arranging the two condensers and two steam cylinders, so that the two condensers being formed in one vessel, with a partition to divide it, the said condenser will fill up all the space between the two steam cylinders, the two air pumps being within the two condensers, and those condensers and steam cylinders applying one and the other with lateral contact, by suitably formed vertical surfaces extending up and down the whole, or nearly whole height of the condensers, and extending an equal height up and down the height or length of the cylinders, so as that the said vertical surfaces of the condensers which are in such contact with the corresponding vertical surfaces of the cylinders, can be firmly united together, each surface to the other, by screw bolts, or other suitable means, in order that all the aforesaid parts, namely, the two steam cylinders and two air pumps, may, by means of the contact and union of such vertical surfaces be firmly united into one combination or mass, whereby each of the said parts will be held and retained in its own intended place by its arrangement and combination with the other of the said parts, without requiring any foundation plates, and without depending materially upon fastening down to the bottom of the ship o
keeping the said parts in place.
the cylinders will of course be fas
to suitable sleepers or keelson
such fastening will be chiefly f
pose of fixing the whole con
place in the vessel. The requisit
cation between the cylinders ar
thereof and the condensers (cal
passages for exhausting the ste
cylinders,) are made in the ver
by the contact and union where
ders and the condensers are uni
the said eduction passages bein
per or highest parts of the sai
as to communicate with the hi
the condensers. The lower pa
linders descend into the surface
sleepers or keelsons, to which
are fastened down, the bottom
linders being very near to the
inside planking, or to the flo
the bottom of the vessel, when
vertical distance below the axes
that the depth of the vessel wil
rendered available for giving t
as much length of stroke as ca
in that class of engines to wl
proved arrangement and combi
The condensers stand upon, o
down to the sleepers or keelson
descend so low as the cylinder
ings for the axes of the cranl
according to the usual mode
framing, as is usual in engines
and is sustained, as usual, by
right pillars, affixed to the
means of projections from the
thereof; there are four such p
cylinder, serving to keep the c
as well as sustain the bearings."

The inventor illustrates the
rangements by a number of
described drawings, and sums
"*And note*, though two
densers, and two distinct air
been described, (that being
most cases,) nevertheless, that
tial to my improved arrangeme
bination, but the same is equa
if the condenser is made witho
tion, so as to be only one co
only one large air pump, equ
capacity to the two air pumps.
no claim to new invention in
the parts hereinbefore mentio
the cylinders, condensers, or c
the air pumps or pump; but
as new invention, is, the impro
ment and combination befo
of the steam cylinders, with
ser or condensers, and air p

: distinctive character of that ar-
ınd combination being, that the
or condenser, are, or is, so ar-
espect of the steam cylinders as
the space between the two steam
id so as to join thereto by means
surfaces of mutual contact and
: condensers or condenser, with
s, which surfaces are held toge-
ifficient number of screw bolts,
: cylinders and the condensers
ıer; also the air pumps or pump,
vertical or inclined, and either
the condensers or condenser, or
case of the pumps being inclined,
-wise,) those pumps being firmly
ıe condensers or condenser, by
before described, and by these
vhole of the said parts are united
escribed, into an improved ar-
nd combination, possessing great
in respect to simplicity, com-
l union of the said parts."

ARWOOD, OF PORTLAND-PLACE,
INTY OF MIDDLESEX, ESQUIRE,
oved means of giving expansion
t.—Enrolment Office, April 7,

ciple on which this invention is
one of unquestionable soundness,
t "it is necessary to the due ex-
the chest (on which the healthful
e entire body depends) that the
iould habitually have a backward
ırd position or inclination;" and
t to be true also, as the patentee
such a habitual position of the
nust "contribute essentially to
on of the shape and figure of the
o an erect and graceful carriage."
lish these objects, the patentee
e shoulders with "certain arti-
r supports, calculated not only
them to assume the proper re-
depressed position, but to sus-
n such position without painful
ient pressure, or impeding the
of any of the muscles of the arms,
r back." These artificial sup-
mposed of thin plates of metal,
uitable solid substance, cover-
ather, or other soft material;
of an outside frame of metal or
n with some soft substance; and
curved, or arched, as to fit with-
nient pressure upon the shoul-
hind parts are of a large pear-
n, in order to present a broad
support for the shoulder-blades,
pon which they rest, and the an-
, which are of a similar shape,
narrower, come down in front.
The shoulder-pieces are connected by elastic bands at the back and front with a waistband; those in front coming straight down, but those behind crossing each other diagonally (like common braces). The effect of these, and other subordinate arrangements which it is here unnecessary to detail, is stated to be "to impart at once great support to the trunk, and a right bearing and action to all the bones and muscles of, and connected with, the upper extremities, and so to prevent, diminish, or remove, without inconvenience, that stooping and protrusion of the shoulders, of which weakness in these muscles, or distortion of the body, is the usual cause." Again:—"The shoulder-pieces being entirely separate, or only slightly connected together by the back-bands where they cross each other, each shoulder-piece admits of the natural play of the shoulder, which it sustains independently of the other." A further important advantage which these supports possess over all other contrivances of this class which we remember to have seen, is, that they do not require straps, or bands of any kind, to be passed under the arms, where pressure of any sort is not only irksome, but certain to be more or less injurious.

NOTES AND NOTICES.

The Story of the Egg—Columbus Anticipated.—Vasari relates an anecdote of Brunalleschi, similar to that recorded of Columbus, though this has unquestionably the merit of being the first, since it occurred before the birth of Columbus. (Brunaleschi died in 1446, Columbus was born in 1442.) A council of the most learned men of the day, and from various parts of the world was summoned to consult, and show plans for the erection of a cupola like that of the Pantheon at Rome. Brunaleschi refused to show his model, it being upon the most simple principles, but proposed that the man who should make an egg stand upright on a marble base should be the architect. The foreigners and artists agreeing to this, but failing in their attempts, desired Brunaleschi to do it himself, upon which he took the egg, and with a gentle tap broke the end, and placed it on the slab. The learned men unanimously protested that any one else could do the same, to which the architect replied with a smile, that had they seen his model they could as easy have known how to build a cupola.—*Latilla on Fresco Painting.*

Ancient Railroads.—It is generally supposed that the Greeks, amid all their advances in abstract science, were comparatively backward in some of the most important practical arts of civilized life, more especially in all that relates to interior communication by means of roads, bridges, &c. There are, however, many strong evidences, both of a practical and a speculative nature, that under all these disadvantages this branch of internal economy was, according to the use and fashion of the age, carried, even at the remotest period of antiquity, to a much higher degree of perfection in Greece than has usually been supposed. Travellers have long been in the habit of remarking the frequent occurrence of wheel-ruts

in every part of that country, often in the remotest and least frequented mountain passes, where a horse or mule can now with difficulty find a track. The term *rut* must not here be understood in the sense of a hole or inequality worn by long use and neglect in a level road, but of a groove or channel purposely scooped out at distances adapted to the ordinary span of a carriage, for the purpose of steadying and directing the course of the wheels, and lightening the weight of the draught, on rocky or precipitous ground, in the same manner as the sockets of our railroads. Some of these tracts of stone railway, for such they may in fact be called, are in a good state of preservation, chiefly where excavated in strata of solid rock. Where the nature of the soil was not equally favourable, the level was probably obtained by the addition of flags filling up the inequalities. It seems now to be generally admitted by persons who have turned their attention to the subject, that this was the principle on which the ancient Greek carriage roads were constructed on ground of this nature.—*Mure's Tour in Greece.*

New Process of Dyeing.—The *Commerce* announces that the Russian Government had purchased for the sum of 1,000,000 rubles the new process of dyeing blue, by means of which the price of dyeing a piece of cloth is reduced to six francs from thirty-two. M. Casimir Périer, the French Minister at St. Petersburgh, was in treaty with the inventor for the acquisition of his discovery, which would "free France from the tribute which she pays yearly to both Indies for indigo."

Different Effects of Vegetables upon different Animals.—Horses will not touch cruciferous plants, but will feed on reed grasses, amidst abundance of which goats have been known to starve; and these latter, again, will eat and grow fat on the water hemlock, which is a rank poison to other cattle. In like manner, pigs will feed on henbane, while they are destroyed by common pepper; and the horse, which avoids the bland turnip, will grow fat on rhubarb.

The Mat Trade.—The bark of the Linden tree is a great article of commerce in Russia, where it is used to make mats, baskets of all kinds, bags, slippers, and other things, and also for thatching. The trades is carried on to a considerable extent throughout the North East of European Russia, from the Ousha and the Wetugt to Kama, where the lindens grow in great abundance, but do not thrive without the shelter of other trees. It is calculated that upwards of 14,000,000 mats are made annually in Russia, requiring 1,000,000 of trees to be stripped, and creating a traffic to the amount of, at least, 3,000,000 of silver roubles, or more than 12,000,000 francs.

Warmth of the Snow Blanket.—At the French Academy of Sciences, (March 14,) M. Arago read a communication on the warmth imparted to the earth by a covering of snow, and respecting which there has hitherto been much scepticism. M. Arago stated that M. Boussingault had ascertained the truth of the theory beyond the possibility of doubt, during the past winter. He found that a thermometer plunged in snow to the depth of a decimetre (about 4 inches) sometimes marked 9 degrees of heat greater than that at the surface.

England's Destiny.—"I do not know, in the history of the world (says Frederick Von Raumer, in one of his recent works), a more noble destiny than that to which England is called, which she has already accomplished, or will infallibly accomplish in due time. The great projects of Alexander fell to the ground at his premature death; Rome established her power by the sword alone, and the destruction of other nations, and she perished in the sequel by her own fault, of a long protracted disease. Mahometanism, in relation to Christianity, was a deplorable retrogression, and the empire of Napoleon only a meteor of arrogant tyranny. The Papal dominion of the middle ages had an eternal value for the education of the human race; but it extended at that time only to Europe, and fell into numerous errors. The errors, however, are not the essence: and this essence will survive all the tricks of political mountebanks. England is the first empire, which embraces the whole earth, every nation; yet the chief weight and the chief value are not in the extent of its dominions, but in the highest activity, united with progress in the sciences, and the most laudable solicitude for the spread of religion. England is the intellectual eye which turns to every quarter, penetrates through every zone, and prepares an exalted future destiny for the human race. Before this noble, comprehensive, glorious destination, the low and violent disputes of domestic parties lose all their importance, or are but shadows that relieve the higher lights."

Logan Rock Replaced in its Former Position.—This great lion of the west, after being kept for the last several years by means of chains and props, from falling off the rock on which it stands, is once more more brought back to its former position. It appears that it had been gradually wearing away the part on which it stood, until it had become a foot distant from its own basis. By the ingenious adaptation of four screws, however, invented by James Tregurtha and J. Hutchens, of the village of Treene, they succeeded in forcing back the rock to its original place, and it may now be moved with greater facility than before, and equal safety.—*Cornwall Gazette.*

Disc Hydraulic Engine.—We have been gratified with the inspection of a very complete hydraulic apparatus, constructed on the principle of the disc engine, by the Birmingham Disc Engine Company, and impelled by a steam-engine on the same principle. The engine, boiler, and hydraulic apparatus, are all contained in a small canal boat measuring 50 feet in length, and 7 feet in width. The engine and apparatus, without the boiler, occupy a space of only 12 feet by 6 feet. When we inspected this machine, it was drawing water from the canal, and delivering it at a height of 5½ feet, through a pipe of 20 inches diameter, which was filled "full bore," and the delivery of the water was almost perfectly uniform. We understand that the quantity of water raised has been ascertained by measurement, and found to be equal to 4,000 gallons per minute, or nearly 40,000 cubic feet per hour. This apparatus has been constructed for one of the canal companies, to be used for emptying the canal, when requisite for repairs.—*Midland Counties' Herald.*

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 975.] SATURDAY, APRIL 16, 1842. [Price 6d. Double.

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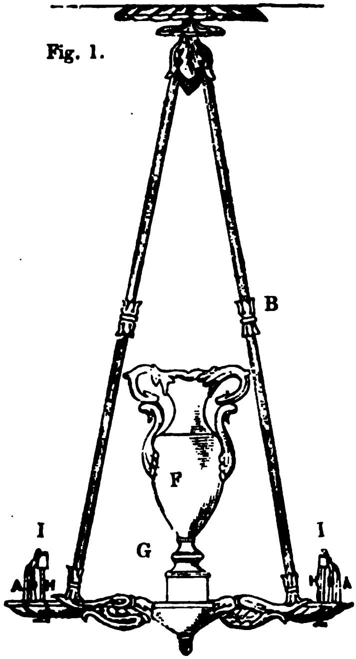
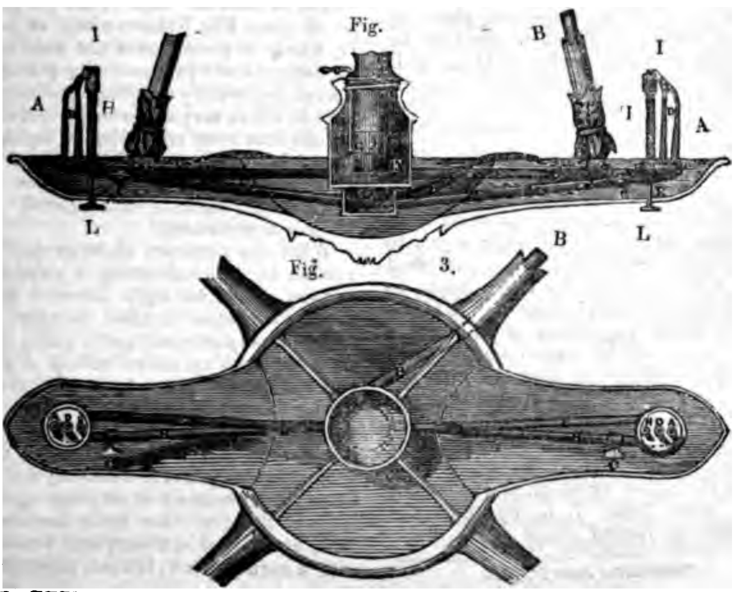
THE DRUMMOND DOMESTIC LIGHT.

Fig. 1.





MESSRS. SIMPSON AND IRWIN'S APPLICATION OF THE DRUMMOND LIGHT TO DOMESTIC PURPOSES.

The prefixed engravings represent an ingenious application of the Drummond Light (so called after its scientific inventor, the late lamented Captain Drummond,) to domestic purposes, which has been lately invented and patented by Messrs. A. H. Simpson, P. H. Irwin, and T. E. Irwin.* We extract the following description from the specification of the patentees.

The invention is stated to consist "in directing a stream of oxygen gas at an angle across a flame proceeding from ignited pyroligneous spirit or any ethereal spirit, and causing the two gases thus produced to impinge upon a piece of lime or other earth containing lime, placed in a receptacle, so arranged, that it keeps the lime at one uniform height, as regards the point on which the gases impinge on the lime, at the same time that the lime is susceptible of being turned round in its receptacle to present fresh surfaces to the action of the gases as occasion may require."

Figure 1 shows a suspending lamp for a room with the improved light attached thereto; fig. 2 is a portion of the same lamp on a larger scale in section, and fig. 3 is a horizontal section of the same. A A are small jets, through which oxygen gas is supplied from a reservoir or gasometer placed in any convenient place, by means of the pipe B; these jets must be provided with stop-cocks, as at C; D D are jets, which are supplied with pyroligneous spirit by means of the tubes E E, from a reservoir F, which is provided, as in the ordinary Argand lamp, with a sliding valve G. The spirit jets are enlarged or bulbed at their ends to receive some cotton wool, so arranged as to allow the ends of the oxygen jets to be brought within it, and are furnished with small apertures for that purpose, as also when the spirit is ignited. H H are hollow stems, supporting at their upper ends, open cups or receptacles, in which are placed cylindrical pieces of lime I I. The lime is fitted into interior sockets, J J, as shown more clearly in the detached fig. 4, and these sockets are fixed at bottom to rods K K, which pass down the hollow stems H, and at bottom have screw heads L L, by which the *lime can be turned* round as the flame burns it away; or the rods K may be attached to clock work if required, so that the lime may receive a constant rotary motion.

Fig. 4.

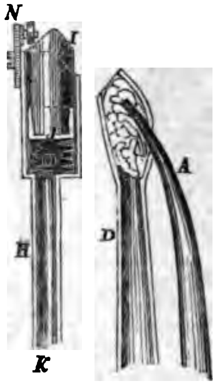


Fig. 5.

O

From fig. 4 it will be also seen that the interior socket J, rests upon a spiral spring M, which presses the lime upwards, as it is burnt, against a small friction roller N, attached to the outer cup or case, and by which the lime is prevented from being forced out of the socket, and is always kept at the proper height to meet the flame of the lamp and jet of gas. Fig. 5 shows a cap, or cover O, which is placed over the lime when the lamp is not in use to keep it dry; though apparently a trifling addition, it is in its effect very important in preventing the lime from crumbling by imbibing damp from the atmosphere when the light is out, and should be put on the moment the light is extinguished, and while it is yet warm.

What the patentees claim as their invention is, "the directing a stream of oxygen gas at an angle across a flame proceeding from ignited pyroligneous spirit, or any ethereal spirit rising in a tube with two apertures bulbed at each end, such bulb being fitted with cotton wool, or other the like substance, or rising in a tube cut off at its upper end in a slanting direction, as aforesaid, thus producing two gases, and causing the two gases thus produced to impinge upon a piece of lime, or other earth containing lime, and placed in a receptacle furnished with a spring below, friction roller above,

* *Patent dated June 17, 1840.*

ng rod as before described, purposes aforesaid, and with ap to place over the lime as

IAGEMENT OF FURNACES AND
BY C. W. WILLIAMS, ESQ.

my last, I enumerated the s of combustible gases which l in a furnace, and for which atmospheric air will be re- e following tabular view of e quantities, as generated harge of coal, with the pe- r respective development and ne during the varying stages s, will convey a fair practical the effects produced in a well rnace by the admission of s of air—in the right place, ht manner. These results nay be tested by all, without laboratory or chemical pro- ot fail to convince us how we ed astray on this subject, by of practical as well as theo- among whom may be men- gold and his followers. Not or adopting, the means of ection, such men, notwith- ir unquestionable talent and uirements, have, themselves, form very erroneous notions er and length of flame, and n of air to furnaces—giving for the proportions of fur- ilers, with even the appear- hematical precision. "The ys Tredgold, "to which the heated smoke of a fire will to be effectual, will depend ght of the chimney and the e fuel; from three to six about the range in a well- re-place: that is, about six l and a good draught, and feet with coke and slow his, of course, will regulate of the boiler." What con- six feet, or three feet, have th of the boiler, it would be to define on any rational or unds; and I am prepared to dictum of Tredgold (which been republished under high nsound and wholly unwar- ry *particular*.

I am aware that I have been much censured for presuming to question the engineering skill of those who are connected with boiler-making. When, however, we find those engaged in this important department so misled, the want of some more practical details will not, I trust, be disputed; and I may here observe, that I have already had abundant proof from many of the highest standing in this branch of business, that I have not laboured in vain.

I have already characterized the gases evolved in a furnace, by the general terms of *coal* gas and *coke* gas, (see Mech. Mag. No. 961,) as well for the sake of brevity, as of directing attention to the peculiar nature of the difference between the former, as generated from the coal, during the early part of the process, and the latter kind of gas, as produced, during the later stages, from the clear red, or glowing embers on the bars, as they progressively approach to the character or appearance of a coke fire. As there are many important considerations arising out of these two states of the charge of coal, which are intimately connected with the admission and action of the air, it is of the last importance that we keep this distinction in mind—many of the practical and chemical errors of "smoke burning" inventors being clearly traceable to its neglect. I will here, then, briefly observe, that, by *coal* gas, is meant the hydro-carbon gases (composed of carbon and hydrogen) evolved from the coal, before it assumes a red or ignited appearance; whereas, by *coke* gas, is meant the carbonic oxide, (composed of carbon and oxygen,) formed from the carbonic acid, in its passage through the glowing ignited mass on the bars, in the form of coke, and after the coal gas has been expelled. The quantity of this coke gas will then be in proportion to the thickness or body of such ignited mass—the current of air passing through it, in its state of incandescence. "Carbonic oxide," observes Professor Graham, (in common with all the other authorities,) "may be obtained by transmitting carbonic acid over red hot fragments of charcoal contained in an iron or porcelain tube. The combustion is often witnessed in a coke or charcoal fire. The carbonic acid, produced on the lower part of the fire, is converted into car-

bonic oxide as it passes up through the red hot embers." I here make this special reference to the process by which this carbonic oxide (which I call coke gas) is produced, as I perceive some practical men err by considering it to be an original formation arising out of the glowing matter, after it has been reduced in temperature; whereas the fact is the reverse, as practice, and the highest authorities, prove: namely, that carbonic acid, being first generated, takes up, "as it passes up through the red-hot embers," an additional portion of carbon, aided by the intense heat of the incandescent mass: the incombustible carbonic acid being thus converted into combustible carbonic oxide.

To this latter, air must therefore be admitted, by some other quarter than through such fuel itself from the ash-pit; since, instead of effecting its combustion, such air, so admitted, would only increase its quantity, (by increasing the quantity of carbonic acid;) and make the evil worse. Having detailed this process more at length in my Treatise on Combustion, I need not here dwell on it.

We will now further consider our charge of coal on the furnace, and the following table will present a view of the relative quantities of those two gases produced from it during the progress of its combustion.

Time in minutes.	Coal gas.	Coke gas.	Total, and length of flame.
Charge of coal	none	10	10
5 minutes	10	none	10
10	14	none	14
15	18	none	18
20	22	none	22
25	22	none	22
30	18	none	18
35	14	none	14
40	10	4	14
45	5	8	13
50	none	12	12
55	none	10	10
60	none	10	10

Column 1. gives the time, in periods of five minutes, when the observations were made. Column 2. represents, in numbers, the estimated quantity of coal gas evolved at such periods. Column 3. that of the coke gas at the same periods. And column 4., being the sum of the *two preceding* columns, may be taken as *indicating the* gross quantities of combustible gases evolved and entri combustion, (if supplied with air, as can be estimated by the lengtl flame passing from the furnaces bridge, and into the flues. It is the generation of the coke gas n certain extent, continue longer first five minutes, and begin soo at the end of thirty five minute pressed in the table—the brilli from the coal gas preventing th light from the flame of the coke being perceived. These, how minor and insignificant details. aimed solely at giving a general d of what is seen; in all cases, how quantity and length of the flam derrated, rather than overrate state of the fire at the time of th and many other circumstances alter the quantities and times: t however, may be considered as general view of the matter.

By the table, it will be seen flame, which, according to the Tredgold, would be but six feet reaches to a length of twenty (and even that is by no means t mum,) while its minimum is than ten feet. Tredgold speak the "flame and heated smoke my furnace, from which the al was drawn, and where the larg tity of gas was produced, then smoke whatever, not even as would dull the bulb of the ther the flame being of a clear and white colour.

Another writer on boilers Tredgold's views) observes, boilers whose fire grates are sq whose lengths are not less t times that of the grate, we ha met with an instance of the flar ing to the end of the boiler, there was a good draught and properly managed." Now th from which the above table w falls in with these proportion fifteen feet long, and the square (three feet). Yet the only reached the end of the b passed above ten to twelve feet —often extending along one of flues, and even illuminating th In a score of other boilers, to have introduced the air in th manner, the flame may be seen.

f an hour's charge, reachy to thirty feet in length, imperfectly developed and lame," but of a brilliant oped character.

the errors to which engiosed, and by which mae led astray, from the iate means of observing thin the furnace and flues; ying the necessary air in and manner. For, in the med, when the air-admisclosed, the flame is not , but nearly extinguished reduced to the Tredgold instead of the interior atthe flues being clear and becomes dark, with a smoke, which renders inn impracticable, and sightil.

e table, we see that before thrown on the furnace, d ceased to be produced: ien clear and of a glowing lame necessarily confined carbonic oxide, or coke there could be no doubt, ir colour and character, as e appearance of the ignited rs. On the charge, howrown on, the coal gas, we place; the former ceasing , or nearly so. This is d for, when we consider ig effect of the fresh coals l mass, and which thus ry cause of the production as, namely, the high temate of incandescence.

s then goes on increasing l length of flame, until, at nty minutes, we see it has ximum of 22 feet from the uing in this state for some ally decreases, while that e gas simultaneously inthe former has entirely the latter alone prevails. m, and even the existence nes at the same moment, tible, until the entire of on the bars has become wing appearance. Should regularity in expelling the r instance, from the prer lumps, or the coal not being evenly spread, the appearance inside will present many interesting and instructive proofs and illustrations, which we cannot now stop to describe.

Towards the close of the charge, and when the flame from the coke gas has sensibly diminished, it will be perceived that the time has arrived for a new charge, and this without opening the fire-door to look in. If the proper time be suffered to pass, or, should the next charge be thrown on too soon, in either case the efficiency of the process will be materially affected—the appearance in the interior will vary—the quantity, rate of progression, and even the nature of the evolved gases will, in a great degree, be altered, and the question of time and economy considerably influenced. There is no difficulty in understanding all this. The observer cannot be deceived by the misrepresentations of interested parties, or the truth obscured by plausible theories. By such means of observation, the owner soon becomes his own master, and his eyes are opened to the truth or fallacy of what he is called on to believe or practise. This is, in fact, making the chemistry of combustion on the large scale, an easy, intelligible, and practical science.

It is now to be observed, that during the process of the entire charge, the atmosphere, as it were, of the flues, will be perfectly transparent. This all-important fact is at once ascertained by looking through them, as from S 1 to S 2;—(see engraving in No. 971;) should any cloudiness appear, or the flame assume a reddish or murky colour, we are at once warned that something is wrong, and called upon to rectify it. This subject, however, will be considered more in detail as we proceed.

Thus, we perceive, that at no stage of the process, from the beginning to the end of a charge, is there a flame of less than 10 feet from the bridge, and even extending to above 20 feet in length—thus at once negativing Tredgold's hypothesis. This flame being perceived to be in immediate contact with the boiler bottom, against which it impinges; where then, it may be asked, can we find any ground for asserting that the length of the flame should "regulate the length of the boiler?" But with still greater force do I ask, where is the foundation for the assertion that there is no combustible gas

produced, and therefore, no demand for air, when the fire in the furnace has become clear, red, or incandescent? Or, that the air so introduced could have, not a heating, but so cooling an effect, as actually to affect the boiler plates injuriously? Nothing can be farther from the fact. Such assertions could only be the result of mere conjecture, in the absence of internal inspection, since, with such aid, it would be impossible to deny or resist the evidence of our senses: yet, such theoretical absurdities are still palmed on the unsuspecting manufacturer, and even by those who affect to be practical men. Let such assertors bring their theoretic reveries to the test of observation. Let them examine a furnace thus furnished with the means of internal observation, and they will then be in a position to appreciate, by both seeing and feeling, what are the results from the admission or exclusion of air. The value of the admitted air, in effecting the combustion of the evolved gases will, however, be more fully illustrated when we come to consider the actual temperature and actual condition of the flues, which shall be the subject of my next communication.

I am, Sir, yours, &c.

C. W. WILLIAMS.

Liverpool, April 8, 1842.

PROGRESS OF FOREIGN SCIENCE.

[In continuation from page 231.]

Artificial Pouzzolanas.

Vicat, whose masterly researches upon the subject of limes and cements are so well known, found, many years ago, that a slight roasting had important effects in improving the clays used in the fabrication of certain pouzzolanas. He has lately announced, that in order that this roasting shall produce its maximum effect, it must be competent to expel fully the water which makes the clay a hydrous silicate of alumina.

Berthier has recently confirmed this determination with reference to some cement clays, brought from Algiers; the fact is of great importance in the correct practice of making artificial cements.

Foreign Agriculture.

The true nature of manures, and the rationale of their action on vegetation, has only begun to be understood within a few years, and is even now much better known, and more scientifically acted on, in certain parts of the Continent than with ourselves.

Until ammonia was known to be the really important matter of all manure, this, its very essence, was every where permitted to be volatilized in the process of violent fermentation, and is even still so in most parts of our own country. A better system, prevails, however, over a large portion of Germany, in Alsace, and in Holland and Switzerland. In the latter country they wash the dung by repeated watering at intervals. The washings are collected, rich in ammoniacal salts, and are saturated with a solution of sulphate of iron, (green copperas) or with sulphuric acid direct, to change the volatile salts of ammonia into fixed sulphates, and in this state the liquid manure is applied to the soil. It produces the most vigorous vegetation, and the sulphate of ammonia being fixed, is all assimilated by the plants, in place of being volatilised in the state of carbonate of ammonia, as with us, when crude fermenting manure is lavishly spread over our lands. Gypsum is often used in place of sulphate of iron, and is readily decomposed by organic matter in certain stages of decay.

In Great Britian, where sulphate of iron from refuse pyritose coal and gypsum may be had almost for nothing, it is singular to find its use thus almost unknown amongst us, while practised by those to whom both these articles are scarce and dear.

A M. Schattenmann, of Bouxmiller, in Alsace, has greatly distinguished himself in this branch of agriculture. As director of some great chemical works, and having had under his disposal the manure produced by two hundred artillery horses, cantoned for four years at Bouxmiller, he has had opportunities of practically experimenting upon a great scale, and has communicated his methods and their results to M M. Dumas and Peligo. His dung-heaps are made on a great square space, paved or puddled, and with a fall from all sides inwards. The stable dung is heaped all over to the height of about 12 feet; a well, sunk at one side, supplies a large quantity of water, which is at intervals distributed by wood shoots over the

hich is *never permitted to get* 'ate *of violent or heated ferment-* :he mass is stratified with pow- ypsum, or copperas, and the : from it, with all the washings, cted in a large underground tank entre, where they are saturated if requisite, with gypsum, or sul- iron. This latter fluid is used, iite, by watering the surface with uch are its potent effects, that he ame traced out by watering with it :ass, can be distinctly traced in a ks by the dark coloured and vigo- getation produced where it was The effects of this treatment stable dung, are to produce, in ree months, a mass (*aussi gras r*) as fat and pasty as cow-dung, ording to his experience, fully :ful.

journal not professedly agricul- .e full details of this intelligent an's methods would be out of but to those interested in the of the original paper ("Comptes ' No 7, for February last) would rtant. The theoretic grounds on his successful practice depends, en fully developed in a form ac- to the English reader by Dr. in his report on organic chemis- lied to agriculture, &c., addressed ritish Association.

of Tide upon Artesian Wells.

rtesian well, which has been some ık at the military hospital of Lisle, ı observed to vary considerably in e and volume of its supply. M :aptain of engineers, has made a ıtinued series of accurate obser- upon the variation, and has ar- the following conclusions.

maximum supply is = 63·55 lit. . The minimum = 33 lit. The 'all the experiments = 48·55 lit. maximum height to which the ill rise (above the surface namely) prevented from flowing off is etres, the minimum 1·956 metres, n of all 2·253 metres.

greatest variations, both in supply ght of column, correspond with iods of the moon's syzygies, and ıima of both correspond in an constant manner with the time of ıres. It may hence be concluded phenomena are due to the tides. riods of *maximum supply* were found to be eight hours after high water at Dunkerque and Calais, so that it would appear that it takes that time to transmit the pressure of the tidal column from these ports, or from the nearest point of coast, to Lille.

Some connexion between the tides and the level of well waters has long been conceived, or observed, in various parts of Great Britain, but heretofore never identified with the actual periods of rise and fall. Some extremely curious questions of a geological character arise from this result. How does the tidal water act on that of the well, without gradually making it brackish? Is the fresh water merely contained between beds of clay, or rock, which partly float upon it, and are *compressed* by the advancing tide, and forced to yield up their watery store, like wine pressed from a skin; or do the columns of salt and fresh water actually mingle? And if so, does the sea water lose its salt in the bed through which it passes, by decomposition, and become fresh? It is quite conceivable that such re-actions might take place as resulting in nearly insoluble salts, would leave the sea water as fresh as many spring waters are found.

Metalliferous Deposits of Sicily.

An able report has been made to the Academy of Sciences on this subject, by M. Adrien Paillette. From this it appears, that some time ago an English company obtained from the Neapolitan government, authority to work mines in Sicily, and full of expectation from the boasted historical accounts of its ancient riches, both mineral and agricultural, had, without any previous research, but merely on inspection of some old working, prepared means of opening mines, and working them on a large scale. The results were unsuccessful, like many others of the same sort, begun in the same reckless way, on both sides of the Atlantic; and they were now so discouraged, that the pumping engines, and stampers, &c., brought at an immense cost from Wales, lie to this day in store at Messina, or abandoned on the shore. Under these circumstances, some of the principal parties concerned determined to send a commission of mining engineers to learn what were the real mineral riches of the country. M. Juncker, *ingenieur en chef* of the Royal School of mines, and M. Paillette, civil engineer, were ap-

pointed, and the present report is the result of their labours. In the introduction they show that in place of this country having been anciently (as believed currently) celebrated for its mines, that no mine was ever known to have been wrought in it previous to the year 1720, and that since that time its mines never had a great, or durable development. They explored in all seventy-one mines, which lie principally in granite and talcose schist; the veins are small, and run in all directions, observing none of that regularity as to bearing, which enables the practised Cornish or Saxon miner to predict, almost with certainty, as to his future labours.

The general character of the lodes is very similar to that of the mines in the central district of France, the Limousin, the Cevennes, &c., and the analogy even holds with respect to the rocks containing them.

Veins of modern porphyritic granite have been discovered penetrating the more ancient fine grained granite, and some metamorphic rocks of transition. The veins generally lie between the granite and the mica schist (this is also the case in Ireland); the ores chiefly found are, argentiferous galena, bournonites mispickel, and grey copper—the minerals of lead most abundant, and principally antimonial.

The most novel or interesting fact given in the report, is with reference to the change of mineral character in the lead ores, said to follow a change in the matrix of rock; thus, the galena is poor in silver in the granite, but rich in this metal when lying in the schist, and still more so when ores of lead and copper occur together.

The report is completed by a table of the assay, as to valuable product, of all the ores found in Sicily and Calabria. The whole is a model of how mining speculations should be commenced, as the origin of the investigation is a beacon to warn Englishmen (if they can be taught) of the fallacy of the El Dorados which they so readily fancy to exist in every foreign land.

Crystalization of Salts.

M. Longchamps has published some experiments tending to show that *all* salts expand in the act of crystalization; *and that the apparent* contraction which often takes place, arises from loss of heat in the solution.

Spring Water containing Arsenic.

Some hot springs have been discovered in Algiers, or *Algeria*, as the French love to call their valuable possession in Africa, at Ham-am-escoutin, which are said to contain a small quantity of arsenic. The water is at 80° Reau., and deposits a large quantity of blueish white sediment which has not yet been analysed.

Safety Paper for Deeds.

It is perhaps known to most English readers, that such has been the extent of fraud committed upon the stamp department in France for years past, by using stamped papers a second or third time, the ink having been discharged, and such the amount of private fraud committed in various ways, by this, and analogous trickery, that a commission of the French Institute has been, for a very long period, engaged in the investigation of the subject, and the endeavour to provide a remedy; and that they have invited and offered rewards to inventors of methods of making safety papers for stamped documents (*papiers de sureté*). A great variety of propositions have been offered to them; some depending on the impregnation of the paper with matters actable on by ink, or other fluids; others on wire-marks, &c., in the substance of the papers; and others (the most numerous) on the production of inks which shall be indelible. Amongst the latter, Bracconot, whose name is familiar as a chemist, has produced apparently the best ink, but the commission, until very recently, had received no plan which it considered as meeting all the conditions of the question. The problem is, however, said at length to be almost, if not altogether solved by MM. Knecht and Zuber, who have produced a paper, which is made by machinery, with a wire-wove mark, in endless sheets, and at the moment of its manufacture (before it leaves the machine) is printed all over with an open pattern in common writing ink, without any thickening or mixture; thus any agent used to destroy writing in common ink upon it, will destroy this pattern too. The paper is further protected from erasure by embossing, and by engraved vignettes, printed all by the paper-making machinery, or actuated by the same train.

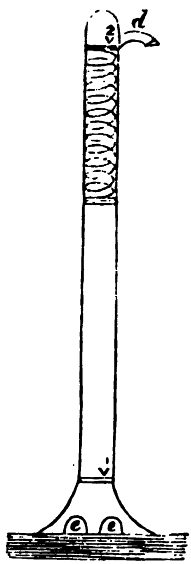
last method is obviously founded on rinciple that no writing fluid for or- r use can be found, capable of being irged by any agent that will not affect common ink, and this is pro- true.

e stamps in our own country will bly soon begin to suffer if they are oing so already, by frauds commit- r the aid of electrotype, for which, colouring and embossing are united, is the most obvious facility; and mptation to fraud will be increased ie anticipated increase of stamp

Elliptic Compasses.

iew elliptic compass has been brought rd in Paris by M. M. Hamman and iel; it traces the *whole* curve, and nded on the genesis of the curve e motion of a point which turns a second, which, in its turn, es with a velocity (*sous-double*) a fixed point.

WATER ELEVATOR.



—In consequence of reading in Magazine the description of Mr. r's water elevator, I am induced id you the particulars of a small instrument for raising water, that I made some years since, but which has been destroyed. I have, however, recently made another, which answers the purpose. It appears to me to be quite a new contrivance in the art of water raising.

I am, your obedient servant,

S. P.

Great Portland-street.

Description.

For the experiment, take any length of lead, or other pipe; enlarge the bottom a little, as in Mr. Walker's instrument, and insert a valve (v^1) to open upwards. Make a few openings, as *e*, *e*, in the wide part, to admit the water to the valve. On the top of the pipe fix a spiral wire of the size of the pipe, say 8 or 9 inches long, and on the top of the wire fix a piece of pipe of the same bore, and about 3 inches long with a valve, v^2, next the wire, to open upwards; close the top of the short piece, and insert the discharge, or mouth-piece (*d*); inclose the whole in a tube of mackintosh cloth, which must be perfectly air tight, and rather longer than the spiral. I make the tube first, and draw it down over the pipe, before I fix the spiral and top; when they are fixed I then draw it over the spiral, and bind it tight at both ends. On placing the instrument, as thus completed, in water, and working the spiral a few times, you will find it answer the purpose.

In my first instrument I made two guide-rods, and fixed them to the short-piece, and they worked through four eyes on the longer piece, and kept the spiral always upright. The spiral is merely to keep the tube from collapsing, which it would do without it.

I have no doubt that if a tube were constructed of leather, say 16 or 18 inches long, and 3, or more, inches in diameter, and fixed on to a pipe of the same bore, it would be found to work well, especially if it were fixed to the pump-rods of Mr. Walker's machine. I find by the drawing, Mr. W. has to lift the whole length of pipe, which, in some cases, must be objectionable on account of the great length.

S. P.

JANUARY 11.

"*Description of a portion of the Works of the Ulster Canal.*" *By Thomas Casebourne, M. Inst. C. E.*

The Ulster Canal, which is described in this communication, was designed for the purpose of facilitating the intercourse between the west and north of Ireland. It commences at the southern extremity of Lough Erne, in the county of Fermanagh, whence it extends for a length of 46 miles, and enters the river Blackwater, near the village of Charlemont, in the county of Armagh, from which there is an outlet through Lough Neagh to the ports of Newry and Belfast. The total cost of this work will amount to about 210,000*l.*, or 4,565*l.*

Allusion is made to a proposed junction canal between the rivers Boyle and Shannon, which may be considered as an extension of the Ulster Canal westward, effecting a junction between all the navigations of Ireland. By its means the produce of the town of Boyle, and the agricultural district around it, would be conveyed directly by steam to Belfast and Newry.

At the time of this communication, the Ulster Canal was rapidly advancing towards completion; it was navigable up to Clones, a distance of 40 miles from its commencement, and would be opened to Lough Erne during the summer of 1841.

A description is given of the most difficult and expensive portion of the canal, which is situated at about six miles along the line from Charlemont. The length of this part is about three-fourths of a mile, and it comprises seven locks. The expense of construction, exclusive of the value of land, was 17,053*l.* 4*s.* 9*d.*; in order to diminish the expense as much as possible, the canal was contracted in width in two points, where the local impediments were considerable. The transverse dimensions of the canal are, 19 feet 6 inches at the bottom, 36 feet at the surface of the water, and 42 feet at the top of the bank,—giving a slope of 3 to 2 at the sides of the channel. The depth of water is 5 feet 6 inches in all the reaches, except the summit level, which is capable of containing 7 feet of water. The course of this portion of the line lay along the bottom of a steep ravine in a limestone rock, parallel with the channel of a mill-race adjacent to the river Blackwater; the mill-race was, therefore, diverted into the river between the first and fifth locks of the canal. Between the third and fifth locks the bed of the canal was formed by benching in the rock on one side, and embanking on the other with the materials so obtained; beyond this it was cut for a distance of nearly 350 yards through the limestone; in one place to a depth of 41 feet. The sides and bed were there lined with puddle, and protected by a facing of rubble wall. Thence, to the seventh lock, the channel was again formed by benching and embanking through a clay soil, where much caution was necessarily exercised in preventing slips at the foot of the embankment, which was subject to inundations from the Blackwater.

The masonry was all constructed of limestone from an adjacent quarry.

Two Appendices are subjoined to this Paper. The first of these gives in detail the items of expenditure for the portion of the canal described; the second contains a particular description of the locks and lock-gates, the bridges, and the earth-work. The locks are 73 feet long, 12 feet wide, and vary in rise from 6 to 11 feet. They are all constructed in ashlar masonry.

The paper is accompanied by three drawings, descriptive of the general plan and the details of these works, which were originally designed by Mr. Telford, and are now under the direction of Mr. Cubitt. They have been executed almost entirely under the superintendence of the author.

"*An account of the permanent way of the Birmingham and Gloucester Railway. By G. B. W. Jackson, Grad. Inst. C. E.*

The object of this railway is to afford a direct communication between the Western and the Midland Counties of England. The communication describes the course of the line until it reaches Cheltenham, where it joins that which was formerly called the Great Western and Cheltenham Railway, which terminates at Gloucester. Its length is 54 miles. The prevailing inclination is 1 in 300; but on the "Lickey" incline, near Bromsgrove, the rise is 1 in 37 for a distance of 2¼ miles, in ascending which the trains are worked by American locomotives, in addition to the usual train engines. The northern portion of the railway appears to lie on the new red sandstone; then passes to the oolitic formation, on which it terminates. In the former, the principal cuttings are through marl, some of which is exceedingly indurated, and troublesome to work. The principal strata of the latter system are blue

ow clays. Near Cheltenham, the and frequently rendered sheet-piling ' in passing through it. The waters wich and Cheltenham were found to a saline quality, which rendered fit for the use of the engines; that : surface sand near Cheltenham, is, , extremely good.

uilding materials employed on this ;—the sandstones of the Lickey and of Dean, the lias of Norton and ough, and the oolites of Cheltenham lon, together with brick, for which s readily procured throughout.

uttings and embankments, with the of the permanent way, are severally 1. The surface width is 30 feet. In ation of embankments and cuttings, al methods appear to have been In the former, the slopes vary be- and 2½ to 1; in the latter, between ½ to 1.

:tings, there is a system of drainage the ballast, consisting of longitudi- ns on either side of the line, con- y cross spits, all of which are filled broken stones. The rails are sup- oy chairs and intermediate saddles, st on longitudinal balks; and these od to transverse ties. On embank- 'hose height exceeds 5 feet, the cross ngitudinal balks, and saddles, are all d with.

ength of the bearings, the weight, ons, &c., of the iron and wood work, : manner of putting them together, noticed.

mber employed was, American pine, glish beech, or larch. The various re enumerated of the materials and or the permanent way, of which the cost per mile amounted to 5,430*l*. sent condition of the line is stated od, and its general working to have fectly satisfactory, since its opening 1840.

ced is a description of an artificial btained by burning clay, which was d where the country did not afford ballast. Its expense slightly exceeds he ordinary ballast; blue clay burnt was found to answer the purpose t it does not appear to form a suc- ubstitute for gravel. The results of ent show it to form a very imperfect The author states that he has always l the quality of this ballast to suffer ortion with the quantity of lime con- a its composition.

aper is accompanied by four draw- ustrating the construction of the per- way.

"*Description of a Water-pressure Engine at Illsang, in Bavaria.*" *By William Lewis Baker, Grad. Inst. C.E.*

The machine described in this paper is the most perfect among nine engines constructed by M. de Reichenbach, for the salt-works at Illsang, in Bavaria. These important works are situated in the most southern part of the kingdom; they are supplied from a mine in the valley of Berghtesgaden, and the salt-springs at Reichenhall. The salt was procured from the former in two states,—that of rock salt, which was extracted by blasting, and that of brine. The rock salt was conveyed to Reichenhall, and there underwent the purifying process. But both these methods were attended with disadvantages from the scarcity of fuel; the old method was therefore abolished, and a line of pipes of 7 inches diameter was substituted, which was laid between the two places; a distance of about 60 miles.

A series of water-pressure engines, each working a forcing pump, and being themselves worked by a head of water, were placed in convenient situations upon the line. The mine is now worked by forming cavities in the beds of salt, and filling them with water, which soon becomes strongly saturated brine; it is then pumped up, and forced through the pipes to Reichenhall, where a portion of it is retained, and the rest is sent on to Frauenstein, which is at the extremity of the line. At these places, the process of evaporation is carried on, and the salt is manufactured in the usual manner.

The paper is illustrated by a drawing of the engine, showing the details of construction alluded to in the communication.

"*A Memoir of Captain Huddart.*" *By William Cotton, F.R.S., &c.*

This memoir is intended by the author chiefly to supply some additional facts which are omitted in the account which was published by his son soon after the decease of this distinguished man, whose "great powers of mind, indefatigable industry, and high principles, raised him to a most honourable position among men of science."

Joseph Huddart was born at Allonby, in Cumberland, the 11th January, 1740. His father was a shoemaker and farmer, and had also a small interest in a herring fishery. Young Huddart was placed under the tuition of Mr. Wilson, the clergyman of the village, and from his son, who had been at Glasgow, he acquired some knowledge of mathematics and astronomy. He early displayed much ingenuity in the construction of models of vessels and of machinery; and while herding his father's cattle, he was occupied in

mathematical reading, drawing, and calculations. His determination to adopt a seafaring life was opposed by his friends; and it was not until he was called upon to take his share of the duties on board the herring-fishing boats, that his father was reconciled to his becoming a sailor. At this period, during the hours of rest after his labours, he was engaged in making nautical observations, and laid the foundation for the chart of St. George's Channel, which was published by his friend, Mr. Laurie, from his survey, and is still the best chart of that locality.

On the death of his father, in 1762, he took the command of a sloop which was employed in carrying salt herrings to Ireland. He then constructed a brig according to a model of his own, every timber being moulded by his own hands. In this vessel he traded for some years to America; until, in 1771, he was induced by Sir Richard Hotham (who had discovered and appreciated his judgment and knowledge,) to leave the brig and engage in the East India mercantile marine. In this extensive field of usefulness, Huddart evinced the superiority of his talents and his inflexible integrity; and his example as a commander was generally followed. While in the Indian service his attention was drawn to the defects in the usual manufacture of cordage, and led to the improvements which he afterwards so successfully accomplished.

He subsequently took a prominent part in the direction of affairs at the Trinity House, the Ramsgate Harbour Trust, and the London and East India Docks, where the valuable advice given by him was properly appreciated, as it was also by the civil engineers, with whom he was so frequently called upon to co-operate.

The memoir then relates many interesting anecdotes of his private life, illustrative of his general scientific acquirements, and of his amiable disposition. It then details, at considerable length, his experiments for the determination of the lines for ships, which, consistent with stability, and what might be required for stowage of cargo, would give the greatest velocity through the water.

The author enters fully into the account of Huddart's inventions and improvements in rope machinery, which he raised to such a pitch of perfection. This machinery, which is now transferred to the Royal Dock Yards, has already been before brought under the notice of the Institution by Mr. Cotton and by Messrs. Dempsey and Birch, in communications, for which prizes were awarded.* The general introduction of chain cables rendered this machinery less useful, but could not take from its original merit; and, in its present position, it will long remain a monument of Captain Huddart's perseverance, mechanical skill, and scientific knowledge.

Sir James South thought that Captain Huddart's scientific attainments as an astronomer had not received their due meed of praise in the memoir; but more especially, that the equatorial instrument, which he was now fortunate enough to have in his possession, should have been alluded to more particularly. That instrument was constructed by Messrs. Luke Howard and Co., of Old-street, from the designs and under the daily superintendence of Huddart. The greatest part of the instrument was put together with his own hands, and the result of this combination of skill and attention was, that up to the present time, the instrument had been unequalled; in fact he must be permitted to say, that he considered it *perfect*. It had been used for all kinds of observations,—transit, declination, and equatorial; and, in all, with satisfaction to the astronomer. With it Mr. Herschel had made many of his observations, and always expressed himself in the highest terms of it. It had been examined by most of the eminent constructors of instruments, as well as many civil engineers, who all entertained the same opinion of its perfection: and, after a minute inspection, one constructor observed, "Here is the best system of edge-bars and bracing I ever saw, and my opinion of the instrument is, that it is perfect in every part."

Sir James then related several anecdotes of Huddart's habits of observation. On one occasion, being ordered to sail from Madras at a certain time, he delayed his departure, because he observed a sudden fall of nearly three-quarters of an inch in the mercury of the barometer. The result of this disobedience of orders (for which he incurred momentary censure) was, that his vessel alone of all the convoy escaped destruction.

The President believed that Captain Huddart was the first to mark out the direct course to China, which is so generally followed at present. He was also the first observer who took a transit instrument out with him, to determine the rate of the chronometer. It was particularly worthy of notice, that the equatorial instrument and the rope machinery, both of which had been designed by and executed under the directions of a self-educated man, destitute of the means of acquiring instruction either in astronomy or mechanics, had been up to the present time, unequalled either in conception or in the perfection of their exe-

* Minutes of Proceedings, 1838, pp. 1—38 and 39—1841, page 171.

Huddart was the constant coadjutor ngineers: he assisted the late Mr. n many of his surveys of harbours, hose occasions had always the com- the vessel, even if he did not parti- . the actual operations of the survey. · Huddart was viewed as a sailor, triking out for himself a new track lestination; as a shipbuilder, con- ; a vessel in order to avoid the de- ich he observed in the ordinary class ; as a hydrographer, displaying in t of the St. George's Channel those of observation and of reasoning iade him an astronomer; as a con- of the equatorial instrument, which ı so justly commended; or as a me- designing and constructing one of t beautiful pieces of machinery on he appeared equally great.

Institution was much indebted to tton for this memoir of Captain :, whose name would be always vene- every member of the profession of ;ineering.

Thornthwaite must in justice correct ıprehension relative to the laying for cables; the idea of that machine ed with the Reverend Edmund Cart- who had projected more improve- ı cotton machinery than any person, Arkwright. The machine was mate- odified by Captain Huddart, and to st be given all the credit for the per- of its proportions, and its careful tion, which had enabled a machine ; twenty tons, and revolving rapidly e vertical spindle, to work a number s without costing £5 for repairs. ister, which preceded the laying ma- veral years, was entirely Huddart's n, and was the origin of his improve- ı rope machinery.

February 8, 1842.

iption of the Port of London, and Works at the London Docks." By t Richardson, Grad. Inst. C. E.

s communication the author examines : of the Port of London, when the odation for landing and bonding produce was almost entirely limited ;le spot, called the "Legal Quay," as only about 1,400 feet in length, g downwards from London Bridge, ; no greater facilities for commerce eginning of the nineteenth century the year 1660, when the quay was d. This state of things continued e year 1773, when Mr. J. Sharp d the formation of floating docks. ear 1800, the West India Docks nenced; in the year following the London Docks were projected, and in the year 1805 the East India Docks were commenced. For all these undertakings Mr. Ralph Walker was appointed engineer, having Mr. William Jessop associated with him for the West India Docks. The paper enters fully into the bad state of the navigation of the river, owing to defective management and other causes; gives a table showing the progressive increase of tonnage and number of ships from the beginning to the close of the last century; mentions the various plans of Dodd, Spence, Revely, and others, for diverting the channel of the river for the formation of more extensive docks, near the Isle of Dogs; and then proceeds to detail minutely the origin and progress of the London Docks, giving the dimensions and mode of construction of the principal works connecting the Eastern Docks with the Thames, which were constructed under the superintendence of Mr. H. R. Palmer, to whom the author has been indebted for much of the information contained in the paper.

The communication is accompanied by fifteen drawings, showing the details of construction of the locks and gates, bridges, quays, embankments, &c.

February 8, 1842.

"*Description of the Ponte della Madelena, over the River Serchio, near Lucca." By Richard Townshend, Assoc. Inst. C. E.*

The bridge described in this communication, is situated about half-way between the town and the baths of Lucca, in the Grand Duchy of Tuscany; it was built by Castracani, in the year 1317, on the site of one which had been constructed by order of the Countess Matilda, early in the twelfth century, and subsequently destroyed; it is believed that a Roman bridge formerly existed on the same spot.

The present bridge is of grey limestone of the country. The large arch of 126 feet 6 inches span, is of a semicircular form, and springs directly from the bed of the river, without any prepared foundation. The smaller arches are of various spans, 46 feet 10 inches, 33 feet, 28 feet, and 7 feet 6 inches. The style of construction is somewhat similar to that of the Pont-y-prydd, over the Taff, in South Wales.

An engraving of the bridge accompanied the paper.

"*Description of the Mill, Forge, and Furnaces of a Welsh Iron Work." By* Thomas Girdwood Hardie, Assoc. Inst. C. E.

The author commences by describi

general plan of an iron work, consisting of six blast furnaces, four double-fire refineries, and a forge and mill, capable of converting into bar-iron the produce of the six blast furnaces.

He then enters very fully into certain alterations of the interior shape of the blast furnaces introduced by him at the Blaenavon works, from which have resulted an economy of fuel, regularity of work, and an improved quality of iron. The principal alterations appear to be, making the interior diameter greater above that at the boshes, and establishing a proper ratio between the diameter of the boshes and that of the charging place, and proportioning both to the height of the furnace. The opinions are supported by calculations of the quantity of blast used in smelting given quantities of ore, and the effect which the form of the furnaces must have in directing the current of the blast through the materials, by which also the point of fusion would be necessarily effected, and the chemical combinations varied. The particulars are then given of the construction of the furnaces at Blaenavon, and the details of the blowing engines, blast mains, regulators, valves, &c., with calculations of the quantity of blast used in the various processes of the manufacture. The construction of the casting houses, with the mode of ventilating by the iron roof, is detailed. The general arrangement of the balance pits, coke yards, mine kilns, and bridge houses are shown, and the author proceeds to describe the forge and mill, which have thirty-five puddling furnaces, with hammers, shears, rolls, and heating furnaces in proportion. He then condemns the usual practice of leaving the coupling boxes loose upon the spindles, as liable to break the rolls, shafts, or machinery, and gives theoretical and practical reasonings for preferring fixed couplings.

The communication is illustrated by three drawings, showing the general distribution and the details of an iron work.

Mr. Lowe believed that there was an incorrectness in the statement of the iron after being freed from its oxygen by the heat of the furnace, taking up a dose of carbon from the coke, thus becoming a carburet of iron, which is a fusible compound, and as such, fell melted into the hearth. On the contrary, he thought that the iron was combined with carbon in the ore, and that there was not any necessity for the medium of the fuel to charge it with carbon.

In reply to "Why the ore required, or why the iron carried away, any of the carbon *of the fuel?*" Dr. Faraday stated, that the *ore being essentially a* carbonate of iron, the first action of heat, either in the mine kilns or in the furnace, was to draw off the carbonic acid and leave an oxyde of iron, and then the further action of the fuel (besides sustaining a high temperature) was to abstract the oxygen of the oxyde, and so to reduce the iron to the metallic state, after which a still further portion of the carbon of the fuel combined with the iron, bringing it into the state of easily fusible, or pig-iron.

As carbon may be communicated to the iron in two ways, distinct in their nature, either by contact with solid carbon, as in the process of cementation, (that by which steel is commonly converted,) or from the carbonated gases, either carburetted hydrogen, or carbonic acid, which occupy nearly every part of the air-way of the furnace, it would be desirable to distinguish, as far as may be in any furnace having a particular form or action, what proportion of the whole effect is due to the one mode of carbonization or the other.

Mr. Wallace stated that the ore was a carbonate of iron, or a protoxyde of iron and carbonic acid united, and not a carburet of iron, (or iron and carbon simply,) as was generally believed. In smelting, the carbonic acid was driven off, the simple oxyde remaining; the oxygen of which, being carried off by the heat, left the pure iron, which, combining with the carbon of the coke, formed a fusible carburet of iron, or the pig-iron of commerce.

Mr. John Taylor observed that his brother, Mr. Philip Taylor, being sensible of the advantages to be expected from the use of anthracite in smelting iron, made a series of experiments several years ago, from which he derived the opinion that the carbon absorbed by the metal, and which is necessary to produce it in the shape of pig-iron, must be presented in a gaseous state to the mass in fusion; and as anthracite did not afford a sufficient supply of coal-gas during combustion to produce the proper effect, he proposed to adopt a very ingenious method, by which this gas would have been thrown into the furnace in such proportions as might be found necessary, mixed with the common air employed as the blast.

Circumstances interrupted the course of these experiments, or it is possible that the use of anthracite for this important application might have taken place at a much earlier period than it has happened to do.

February 15, 1842.

"*Description of Chelson Meadow Sluice.*"
By Theodore Budd, Grad. Inst. C. E.

The sluice which is described in this communication was erected from the designs of Mr. Rendel for the Chelson Marshes in

, which, being very low, had prefered much from floods, but now ly relieved. The novelty in the n consists in hanging each of the ectively by two hinged flat bars of feet 6 inches, and 15 feet 3 inches and thus, by placing the centre of high above the centre of gravity ors, to give greater freedom of n by the modes usually adopted works.

nensions of all the parts, and the f construction, are given in great l are illustrated by a drawing.

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endel explained that the sluiceich had been superseded by those by Mr. Budd, were of the ordinary h, placed side by side. They were hinge-bound and clogged up, used the land to be flooded somethree months during the year; the re attached in the usual manner to s, close at the head of the doors, required a pressure of at least 6 water to act upon them either way. lered the principal advantages of 's to consist in the freedom of action the length of the bar-hinges by y were suspended, their giving the it of opening, and the pressure of id of water sufficing either to open hem.

ior inquired whether there was any between these sluice-doors and d by the President near Blackfriars t the bottom of Fleet Ditch. That so well hung as to be even acted he wind; and the slightest pressure sufficed to open or to close it.

esident explained that the principle ie same; at the Fleet Ditch sluice inges were used, or rather hinges k between the part attached to the d that which was screwed to the hat form of hinge always acted d allowed the doors to open with a ssure.

ON'S APPLICATION OF MARINE YING AND HYDROMETRY TO 'RACTICE OF CIVIL ENGINEER-

insular and maritime country it Britain, there is no branch of ineering which one would expect ore assiduously cultivated, or in a more matured and perfect state, than hydraulics.* But although we can, perhaps, boast of as much in the way of performance in this line as most nations, it is but too certain that we must look elsewhere than to English books for nearly all the science belonging to it. Our Smeatons, Telfords, and Rennies, have at best but turned to good practical account, in the embankments, drainages, docks, &c., for which they are celebrated, the principles of construction which they found developed to their hands in the writings of the Italian, Dutch, and French engineers and philosophers, particularly Guglielmi, Frisi, Mariotte, Belidor, Bossut, and De Buat. Of our men of abstract science, the only names which occur to us as connected with contributions to hydraulics, worthy of mention, are, Robinson, Hutton, Leslie, and Young; and these contributions, besides being scanty, are all more of an elucidatory than original character. Of *making a study* of this branch of engineering knowledge, more than any other, to qualify a man for professional eminence in England, few, if any, of our engineers, have ever thought. In this, as in but too many other matters, it has been always too much the fashion, with us, to find the occasion for the knowledge first, and to let the knowledge come after, as it may. When the at-all in the story was asked, "Can you play on the fiddle?" his answer was, "I don't know, but I'll try;" and so with our engineering aspirants, the rule has been, first to get a dock or harbour to do, and afterwards to find out how it is to be done. And though now and then, some egregious blunder will occur, to furnish its instructive commentary on this inversion of the proper order of things, it must be confessed that, in general, its worst effects are to be traced in that excess of expenditure over estimate, for which English engineers have become almost quite as

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atise on the application of Marine Surl Hydrometry to the Practice of Civil g. By David Stevenson, C.E. Pp. 174. with 13 Plates. A. and C. Black, Edinale, London.

* *Hydraulics*, in its common acceptation, includes every thing mechanical having any relation to water, from the huge breakwater erected to oppose the inroads of the ocean, down to the garden watering pan; but strictly speaking, it relates only to the motion of water in pipes, being compounded from ὕδωρ, water, and αὐλος, a pipe. Would not *Hydratics* be a better term, and square well with *Pneumatics*? Hydraulics might then be restricted to its original signification—reduced to its proper rank, which is that of a General of Division, while *Hydratics* would become, by right of suffrage, the true Generalissimo.

famous as for the excellence of their constructions.

We are accustomed to hear all sorts of reasons assigned for such excesses—unfavourable seasons, "accidents by flood and field," extra works, &c.—but the reason which is more potent than all—the *trying* to play on the fiddle before learning—is but rarely glanced at, or if occasionally urged by some obstinate malcontent, only to be drowned by a flourish of trumpets from the successful engineer and his friends. It would not, perhaps, be straying far from the truth, were the item which now stands as "contingencies" in most estimates for public works, expunged, and the following inserted in its place—"*To education of the engineer*," 100,000*l.* or 1,000,000*l.* as the case may be.

It is but one of the natural results, or rather types of this state of things, that there should be such a paucity of works, in our language, on hydraulic engineering. Where there are so few learners there cannot be many teachers. To even the most rudimental and essential parts of the art or science, there are either no guides, or none that are trustworthy. The making of soundings, sections and borings, tidal and hydrometrical observations, are, for example, things of the first necessity; but how to make them, none of our authors have been at the pains to show, explicitly and fully. A desire to supply—so far—the great existing deficiency in this branch of our scientific literature, has led to the production of the work before us.

The author, Mr. Stevenson, is already favourably known to the public by his clever and instructive "Sketch of the Civil Engineering of North America." In his present work we have some of the fruits of his own engineering practice. "The observations," he says, "contained in the following chapters, have been thrown together at intervals of leisure from more urgent duties, and are chiefly the result of a pretty extensive experience obtained in the course of surveys, which were either at an early period conducted by myself, or have latterly been made under my directions." It would be well for the world, were all learned leisure employed to as good purpose. A work of more extensive practical utility, more certain to bring honour to its author and confer lasting benefit on his profession, has seldom come under our notice.

As the series of operations necessary in the survey of a river, embrace almost every point of consequence in the general application of surveying and hydrometry, to the practice of hydraulic engineering, Mr. Stevenson judiciously makes them the principal object of his attention; supplying, as he proceeds, those further explanations, which are occasionally necessary with respect to the surveys of harbours or lines of coast. The subjects treated of in succession, and each with great particularity of detail, are Triangulation—The Base Line—Tidal Observations—Soundings—Low Water Surveys—High Water Margin Surveys—Cross Sections and Borings—Hydrometrical Observations (on the Discharge and Velocity of Rivers, Qualities of Water, &c.)—Protraction of the Triangulation, Base Line, and Traverse Survey—and Protraction of Low Water Survey and Soundings. The work is not of a nature to afford much quotable matter, nor is it easy, by any quotation, to exemplify the value of the information which it contains; but the following extracts will at least serve to show that it is not deficient either in originality or novelty.

Local Variation of the Magnetic Needle, a frequent but neglected source of Error in Surveys.

"The magnetic needle, independently of those changes which are ascertained to be constantly going on in its direction and dip, to which the term "variation" has been applied, is subject to other variations occasioned by local attraction, in consequence of which, it has, under certain circumstances, been found, that, in surveys even of limited extent, the magnetic north, as indicated by the needle, varies in its direction to a very appreciable amount at different stations. The causes of these variations are in some cases very apparent, but in others they are not so easily discovered, and therefore cannot be so well guarded against. I have met with many instances of errors in observations produced by local variation, some of which have given rise to considerable trouble, before the cause from which they proceeded could be detected. On the river Tay, for example, I found the variation on one occasion to amount to 2° 30′ in a distance of about a quarter of a mile. The first of the series of observations by which this local variation of the needle was discovered, was made on the top of a high bank, about 50 feet above the level of

er, and the second on a low tide sandbank in the middle of the ıut the attracting influence could this case, be satisfactorily ascer- On another occasion, an error, ng to no less than 7°, was intro- to the bearings of a survey, in con- of certain observations which had ferred to the magnetic north having ide in the vicinity of a large steam which lay concealed from view in a se, close to which the instrument a set, and the influence of this mass on the data of the survey, could not, ime the observations were made, be In another instance an error of 2° like manner introduced into a har- rvey, owing to the instrument having idvertently set too near a cast iron ; pall which was fixed on one of the

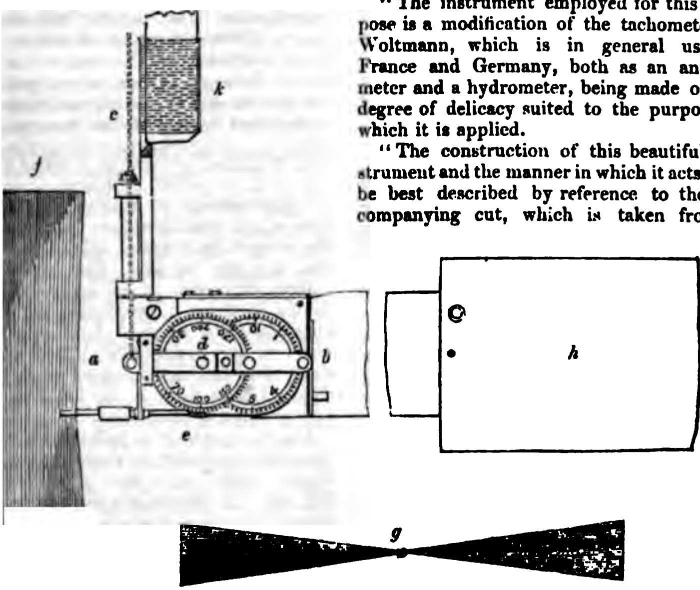
he Datum Line for Soundings.

s evident that all soundings must be or referred to one datum line, before t notion can be formed of the depths r at the places where they were taken. it opinions have been advanced as to st convenient datum to be used for pose. When the whole rise of the a be observed, which is the case in surveys situated on the coast, the ide mark,' or that central point from he high and low water levels of every tide are very nearly equidistant, is a convenient point for referring to. The existence of such a point 'equidistant from the high and low water of any one tide and on the same level, or coinciding with the points half way between high and low water of every other tide,' has been determined by observations made in several situations. It is believed to have been first detected in 1830 by my father, while surveying the Dornoch Frith in reference to a salmon fishing question, and is particularly alluded to in his report to the Court of Session on that subject, dated 31st January, 1831. In 1833 it was found to exist in the Frith of Forth, in making the tide observations for a harbour survey; and in 1834, in surveying the Skerryvore Rocks on the west coast of Scotland, with a view to the erection of the Skerryvore Lighthouse. In 1835, I obtained the same results at the Isle of Man; and in the same year Captain Denham brought a similar result, obtained from extensive observations made at Liverpool, before the meeting of the British Association, held at Dublin. The agreement of these different series of observations, made at points so far distant from each other, seems to prove the universality of the phenomenon, at least on the shores of this country."

Instrument for Measuring the Velocity of Water.

"The instrument employed for this purpose is a modification of the tachometer of Woltmann, which is in general use in France and Germany, both as an anemometer and a hydrometer, being made of the degree of delicacy suited to the purpose to which it is applied.

"The construction of this beautiful instrument and the manner in which it acts, will be best described by reference to the accompanying cut, which is taken from a



tachometer or stream gauge made by Mr. Robinson, optician, London, and is drawn to a scale of one-third of the full size. In this view *f f* represents what may be termed a driving vane, which is acted on by the stream, and of which *g* is a plan. The plane of this vane is twisted, as represented by the dark shading in the cut, so as to present, not a knife edge, but an oblique face to the action of the current, which by inpinging on it, causes it to revolve exactly in the same way that the wind propels the sails of a windmill. On the spindle or shaft of this vane an endless screw is fixed at *e*, which works in the teeth of the first registering wheel, and causes it to revolve, when the vane is in motion and the screw in gear. Letters *a* and *b* represent a bar of brass, to which the pivots on which the registering wheels revolve are attached. This bar is moveable on a joint at *b*; and at the point *a*, a cord *c* is fixed, by pulling which the bar and wheels can be raised, and on releasing it they are again depressed by a spring at *d*. When the bar is raised, the teeth of the wheel are taken out of gear with the endless screw, and the vane is then left at liberty to revolve, the number of its revolutions being unregistered; but when the cord is released the spring forces down the wheels, and immediately puts the registering train into gear, in which state it is represented in the cut. Letter *h* is a stationary vane (which is shown broken off, but measures about 9 inches in length) for keeping the plane in which the driving vane revolves, at right angles to the direction of the current, and *k* is the end of a wooden rod to which the tachometer is attached when used. The different parts of the instrument itself are made of brass.

"The moveable bar for the registering wheels and the application of the cord and spring which have been described, afford the means of observing with great accuracy, in the following manner. The instrument having been adjusted by setting the registering wheels at zero, or noting in the field book the figure at which they stand, the cord is pulled tight so as to raise them out of gear, and the instrument is then immersed in the water. The vane immediately begins to revolve from the action of the current, and is permitted to move freely round until it has attained the full velocity due to the stream. When this is supposed to be the case, a signal is given by the person who observes the time, and the registering wheels are at that moment thrown into gear by letting the cord slip. At the end of a minute another signal is given, when the cord is again drawn and the wheels taken out of gear, and on raising the instrument from the water the number of revolutions in the elapsed time is read off. This operation being completed in the centre of each division of the cord, the number of revolutions due to the velocity at each part of the very line where the cross section is taken, is at once obtained.

"Before using the tachometer, it is obvious that the value of a revolution of the vane must be ascertained; and although this is done by the manufacturers, it is proper that the scale of each instrument should be determined by the person who uses it, and that it be tested if the instrument has been out of use for some time, before being again employed in making observations. A scale sufficiently accurate for most hydrometrical purposes, (though not for the instrument when used as an anemometer,) may be obtained by applying it to some regular channel, such as a mill lead formed of masonry, timber, or iron, where the velocity is nearly the same throughout, and noting the number of revolutions performed during the passage of a float over a given number of feet, measured on the bank. In this way, it was found, by the mean of sixty-two observations, that each revolution of the vane in the instrument of which a drawing has been given, indicated the passage of the water over forty-six inches. The number of revolutions at several parts of the stream was ascertained to be the same in equal times, at both the commencement and the end of the experiments. This number, therefore, becomes in the instrument alluded to, a constant multiplier of the number of revolutions indicated by the vane; and hence, the number of feet passed over by the water in the given interval of time, is ascertained."

Instruments for obtaining Water from different Depths.

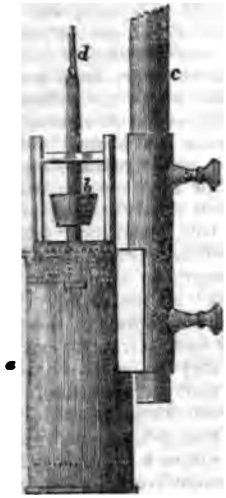
"Instruments of various constructions have of late been tried for experimenting on this subject, by Scoresby, Sabine, and others; and as I am not aware that any work on marine surveying, or on surveying instruments, contains a description of such an apparatus, (to which I have applied the name of the *hydrophore**,) the following account of two modifications of it, both of which I have been in the habit of using, may perhaps be instructive.

Fig. 1. represents a hydrophore used for procuring specimens of water from moderate depths, drawn on a scale of one-tenth the full size. It consists of a tight tin cylinder, letter *a*, having a conical valve at its top, *b*, which is represented in the diagram as being raised for the admission of water. The valve

* ὕδωρ and φορέω.

dead or immoveable on a rod work-
aides, the one resting between two

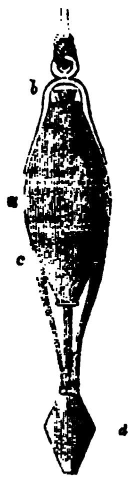
Fig. 1.



s of brass above the cylinder, and
er in its interior, as shown in faintly
lines. The valve rod is by this means
to move in a truly vertical line, and
re attached to it consequently fills or
the hole in the top of the cylinder,
eater accuracy than if its motion were
ted. A graduated pole or rod of
, which in the diagram is shown
off, is attached to the instrument, its
ng inserted into the small tin cylinder
side of the large valve or water cy-
and there fixed by the clamp screws
in the diagram. The bottom of the
ylinder may be loaded with lead to
tent required for the purpose of
; the apparatus to sink; but this,
an iron rod is used for lowering it, is
necessary. The spindle carrying the
has an eye in its upper extremity, to
a cord is attached, for the purpose of
g the valve when the water is to be
ed, and on releasing the cord it again
by its own weight. When the hydro-
is to be used, it is lowered to the
d depth by the pole, which is fixed to
; or if the depth be greater than the
of the pole, it is loaded with weights,
down by means of a rope so attached
keep it in a vertical position. Care
be taken, while lowering or raising it,
he small cord by which the valve is
l, be allowed to hang perfectly free
ack. When the apparatus has been
d as far as is required, the small cord
is pulled, and the vessel is immediately filled with the water which is to be found at that depth. The cord being then thrown slack, the valve descends and closes the opening, and the instrument is slowly raised to the surface by means of the rod or rope, as the case may be, care being taken to preserve it in a vertical position. This apparatus is only applicable to limited depths, but will generally be found to answer all the purposes of the civil engineer.

The form of hydrophore represented in fig. 2, is used in deep water, to which the small one, just described, is inapplicable.

Fig. 2.



It consists of an egg-shaped vessel, letter *a*, made of thick lead, to give the apparatus weight, having two valves, *b* and *c*, one in the top and another in the bottom, both opening upwards; these valves (which are represented as open in the diagram) are, to ensure more perfect fitting, fixed on separate spindles, which work in guides in the same manner as in the instrument shown in fig. 1. The valves, however, in the instrument I am now describing, are not opened by means of a cord, but by the impact of the projecting part *d*, of the lower spindle on the bottom, when the hydrophore is sunk to that depth. By this means the lower valve is forced upwards, and the upper spindle (the lower extremity of which is made nearly to touch the upper extremity of the lower one when the valves are shut) is, at the same time, forced up, carrying along with it the upper valve, which allows the air to escape, and the water rushing in, fills the

vessel. On raising the instrument from the bottom, both valves again shut by their own weight, and that of the mass of lead, *a*, which forms part of the lower spindle. The mode of using this hydrophore is sufficiently obvious; it is lowered by means of a rope made fast to a ring at the top, until it strikes on the bottom, when the valves are opened in the manner described, and the vessel is filled; on raising it the valves close, and the vessel can be drawn to the surface without its contents being mixed with the superincumbent water through which it has to pass. This instrument weighs about half a hundred weight, and has been easily used in from thirty to forty fathoms water in making engineering surveys, and could no doubt be employed for much greater depths, if necessary. It is represented in the cut on a scale of one-twentieth of the full size."

In an Appendix to the work, the author gives a useful Abstract of the Standing Orders of the Houses of Lords and Commons, with respect to Bills for making, maintaining, varying, extending, or enlarging Canals, Reservoirs, Aqueducts, Water Works, Navigations, Harbours, Docks, &c.

THE DOUBLE ACTING ROTARY ENGINE AFFAIR—AGAIN.

Since we plucked from the mock crown of this scheme, the only false gem that was likely to *dazzle* the public, the projectors have, with a very proper discretion, thrown it aside as a thing no longer of any use. A new prospectus has been put forth *without the names of any persons as Directors*. The only individuals who now appear as sponsors for the scheme are "Edward Lomax, Esq.," (the "eminent") who enacts the part of "engineer," and "Hyppolytus de Mancel, Esq.," who does that of "Secretary." Even the Count de Predaval, of the Austrian Imperial service, who was stated to be the inventor of the "double-acting" wonder of wonders, no longer figures—by name at least—on the scene. The "Patentee and promoters"—that is to say, Messrs. Lomax and de Mancel, for and on behalf of the "patentee and promoters," whoever they may be, and where-ever they may dwell, (Hanwell, Hoxton, *or St. Luke's,)* now "give notice that *they are ready to contract* for supplying parties or companies with *warranted* double-acting rotary engines," at the following rates per horse power: "Stationary engines, acting by cold water or *melted lead*," 30*l*., "mercury included"—"marine and locomotive engines acting by cold mercury, kept quite harmless," 40*l*. and 50*l*. (the "melted lead" is a new feature—what it means we really have no idea.) Of these "ere trifles" there is to be paid "*one half on delivery*, the other half three months after;" and lest any doubt should arise as to whether the "one half," and the "other half" make one whole between them, there is a positive assurance added, that the two halves mean "all included." Who can doubt of the willingness of the parties to *contract* on such terms for any number of engines they can receive orders for—aye and to *warrant* them too? Engines equal to 1000 horses power (if of any) would not cost twice as many pounds—so mighty simple a thing it is! but the "one-half on delivery" at an average of 35*l*. per horse power would produce 35,000*l*., leaving a net sum in pocket of 33,000*l*.! Not, of course, to be *run off* with—that we are far from insinuating—but to constitute a guarantee fund, of which Messrs. Nobody, Brothers, and Co., or some other equally substantial firm, (yet to be appointed) will be the "bankers;" for *of course* "the company" will not think of making any dividends till "the three months after" have tested the worth of the machines delivered. But the order—the actual order—for the 1000 horses power—what likelihood is there of that? Not much, we should say, were the rationalities of the case only to be looked at in a rational spirit; but John Bull is notoriously an exceedingly gullible personage, and Messrs. Lomax, Hippolytus de Mancel, and Co., are persons of exceedingly imposing ways. In spite of our exposure of the gross absurdity of this "double-acting rotary" affair—in spite of its palpable impracticability, we observe that Mr. Lomax persists in the new prospectus without directors, in assuring the public, "upon his professional reputation," that "the invention is an *ingenious, practicable, efficient*, and *economical* arrangement of machinery, founded on *scientific principles*, and an *adaptation of the immutable laws of nature to the wants of man*," &c. &c., and that Mr.

tus de Mancel persists with ravery in certifying that the f the said very ridiculous asser- no fool, but one of "several engineers," who have examined system, and are perfectly quali- udge of its merits! *Par nobile !* the one as "eminent" as the veracious, and both as innocent ention to do wrong, as their con- free from every appearance of and quackery!

YN'S MANUAL OF THE STEAM ENGINE.*

re free to admit that notwith- the number of books which en already published on the ingine, there is still room for a tter than has yet appeared; and ng also to concede to the author Manual" before us, that what is nted, is that which he has at- namely, the reduction of the ce which has been written on the into a "popular" form. But discriminate recompilation and g is not to our minds improve- neither do we see how a book rows no new light on a subject id to make it any clearer, or by greater clearness, more "popu- n it was before. Mr. Hoblyn to us to have left the history, d practice of the steam engine re he found them; with every error preserved, not a single cleared up, and chaff and grain gled and confounded just as ever.

Hoblyn, as most other writers on engine have done, makes Hero's his starting point. He gives an g of (what is said to be) it, from Lardner, who probably t from some one else, and de- it also in nearly the same words , in the hope that what we have rk on them, may prevent them, ing repeated again, we shall here

ut 120 years before the present era, it machine was *constructed by Hero ndria*, in which a rotary motion was l by means of steam. A hollow globe, placed on pivots, was furnished *with a number of horizontal tubes radiating from it like the spokes of a wheel*, and closed at the extremities, with the exception of a small orifice near the end, and on the side of each tube. The globe being supplied with steam the fluid rushes through the orifices with a force *equal to the excess of its elasticity over that of the atmosphere*. The recoil produced by this difference of pressure repels the tubes in the opposite direction, and a rotary motion is produced, which may be communicated to machinery connected with the globe," p. 20.

Now, in the first place, Hero (whose *own* account of the affair we have now before us) does not say that it was "constructed" or invented by him. He gives it, on the contrary, as one of many pneumatic contrivances well known in his time. Secondly, the engine, as figured and described *by Hero himself*, has but two arms; the round dozen given to it in the engraving common to Lardner and Hoblyn, is an absurdity of modern invention, of which Hero was too good a mechanician to be guilty. And, thirdly, *Hero himself* assigns no such cause for the action of the engine as the force of the steam issuing from the orifices being "equal to the excess of its elasticity over that of the atmosphere;" he probably knew that it would act just as well with no atmosphere at all to act against, for there is prefixed to his "Spiritalium" a preliminary essay "of vacuum," which shows that he had not, even at his early day, a great deal to learn on the subject.

Hero's engine is pronounced by Mr. Hoblyn (as by others before him) to be but an "ingenious toy;" but there are at this very time several engines doing good work in England, which act precisely on the principle of that toy, and vary from it only in details, in which it is easier to recognize a difference than a distinction. We allude particularly to those erected under Mr. Craig's patent. We do not say that these engines do better work than others, or as good; these are points on which we do not feel called upon to offer any opinion here; but we cite the fact of a certain useful effect of considerable amount being now daily obtained from engines on this plan, to show that it deserves at least a far more honourable place than Mr. Hoblyn, and others of his superficial class, have been pleased to assign to it. And this we are the more induced to do because Mr. Hoblyn himself takes no notice at all of these "modern instances;" except it be to

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* nual of the Steam Engine. By Richard , A.M. Oxon. 294 pp. 12mo, with nu- gravings. Scott, Webster, and Geary.

repeat (in the parrot style, which characterizes the whole of his book) the objections of Mr. J. Scott Russell to all rotary engines whatever, without attending to the fact that sweeping as these objections are, Mr. Russell admits that they resolve themselves more into difficulties of a mechanical nature (and therefore not *impossible* to be overcome) than into any absolute fallacy in principle.

The invention of the cylinder and piston Mr. Hoblyn ascribes to Newcomen and Cawley—only repeating again in this what others have said before him. If he will take the trouble to refer to the "Spiritalium," Art. xxvii., he will find that with regard to these, also, the toyman Hero had anticipated the Devonshire tradesmen by near two thousand years.

The subject of Steam navigation occupies a large space of Mr. Hoblyn's volume—and deservedly so; but the proportion of that space, (nearly one-third) devoted to Mr. Samuel Hall's condensing apparatus (to say nothing of the double-leads!) stands in strange contrast with the actual position of that invention at the present time. It looks more like a puff or advertisement done to order than any thing else. Mr. Hoblyn seems to be wholly unaware of the fact that the mode of condensation which he lauds so highly has, after full trial, been almost universally abandoned.

In an Appendix to his book, Mr. Hoblyn devotes about a dozen pages to the very *relevant* subject of "Causes and Prevention of slips or falls of Earth from the Slopes of Excavations on Railroads." What such things have to do in a "Manual of the Steam Engine," Mr. Hoblyn leaves his readers to guess. Had they been *original*, we should have concluded that they were intended to show that he *could* do something in that line,—the manifestations to the contrary in the body of his work notwithstanding; but it so happens that they also are borrowed, and borrowed from a contemptible source which nobody else would think of quoting.

ON LIMES AND CEMENTS—MR. FROST'S EXPERIMENTS—COL. PASLEY'S TREATISE.

Brooklyn, New York, June 1, 1841.

Sir,—It may be known to you, as well as to many of your readers, that some years ago I expended a vast deal of time and money in attempting to improve the theory and practice of forming better limes and cements than were previously known, and that I fully succeeded in producing better limes, cheaper and better looking cements. But it may not be so generally known that I met with a circumstance as mortifying as it was vexatious, namely, that I could produce on a small scale, but never on a large scale, a cement exceedingly preferable to all others for architectural purposes, being of a fine white, or greyish white colour, while all other cements previously produced were of a very disagreeable, if not odious colour. From the chemical constitution of this cement, I know it to be also impenetrable, its hardness exceeding that of all others, none of which ever equal the hardness of good statuary marble, while I have specimens varying from three, to nearly six times the hardness of that expensive and beautiful material. This new cement, therefore, stood unrivalled in these several respects: First, it was imperishable in the air, or rather rain of London, which, loaded with carbonic gas, speedily destroys or dissolves all calcareous carbonates, as the marble statue of Queen Anne, in front of St. Paul's Cathedral, wearing its second or third head, effectually demonstrates. Second, it possessed immensely greater hardness. And third, it was perfectly plastic, a consideration as much beyond all computation, as the tedious and expensive labour of the statuary is to the rapid and inexpensive work of the modeller.

I have now the pleasure of informing you, that patience and science conquered the difficulty that so long opposed my attempts to produce this good thing on a large scale and at a cheap rate, and that I can send from this country white cement possessing all the properties before specified, or instruct any persons desirous of engaging in the manufacture in England, where the materials abound.

There have been many treatises written on cements in France, England, and other countries at various times; but a really good and comprehensive one remains yet to be written. All who have yet undertaken the task have taken much too narrow views of the subject, and it will be hereafter a matter of much wonder how the deuce, any of them could have been satisfied with the little they know about it.

It is but a few days since I saw Colonel Pasley's elaborate work on ce-

and cannot yet say which is most dmired, his immense satisfaction s immense discoveries, or his pro- contempt for all other writers of r countries. Witness his remarks nelin's patent mastic cement, page ticle xxxiii. of his Appendix. very ingenious composition, which n excellent stucco, shall be noticed *hough invented by a Frenchman.*" amazing condescension in the Colonel!

n Colonel Pasley's work it would s if he were acquainted with the rth, and parentage, of every per- o has ever cemented, yet in this one e, at least, had his scientific read- en only equal to his national pre- , he might have spared himself the of this passing compliment to Frenchman," for true it is that ne cement had been invented in d a century before Hamelin's had been actually patented under ne quaint name of *Mastic*, and en the subject of suits of law for ement of the patent, &c., &c.

uld like, by the way, to be informed r there is any of this old mastic now to be found in England of of a century, because, if there is e fact will prove it to be a sub- of no great durability, and furnish n against its renewed use.

contempt of Frenchmen, shown above extract, however natural in ble Colonel, seems rather incon- at this time of day, when Eng- and France have become wise to be friends, and the more so, ring that the Colonel, in his com- (which he has mistaken for know- has occupied no less than twenty- pages of his work in copying M. treatise on limes, published twelve since; and forty-one pages of his n copying M. Tredescant on the ubject.

writing a large book is considered y a proof of great erudition, and writing of a book on a learned may by many be mistaken for proficiency in the science of which s, and as the matters embraced in lonel's work are of very great im- ce,—as he has made himself much free than welcome with my name, ith my works, which he has in cases *grossly misrepresented*, from *lerstanding them*, I send you this letter as the first of two or three, in which I intend to show the numerous mistakes the Colonel has made, and to do my best to place the whole subject in a better light.

That more information is needed—that more information will be useful—that if nothing more than a classified statement of the knowledge already generally possessed were published, many ignorant and absurd attempts at improvement would be prevented, and many and large improvements in building become of easy and certain attainment—all must readily allow. An amazing proof of this has been furnished in England, in the late prodigious attempt to improve calcareous cements by cookery instead of chemistry.

I shall address you in continuation at an early day. Give me but a fair hearing before my country; I have sins enough without misrepresentations, to answer for; and it will be seen hereafter, that to misrepresent what I have done, is to do what neither you, nor your numerous readers, will, I am sure, ever willingly do,—misrepresent the cause of science.

I am, respectfully, dear Sir, yours,

JAMES FROST.

STEAM BOILER EXPLOSIONS—SUGGESTION FOR THEIR PREVENTION.

Sir,—I believe it is generally understood that the explosions of steam boilers are occasioned by hydrogen or some other gases accumulating and mixing with the steam in the boilers; at least, that some kind of explosive mixture takes place, by which the boilers are burst,—the boiler valves not acting at times properly, or not opening sufficiently to allow of the escape of the mixed vapours or gases into the open air. If so, would it not be a good plan to blow a steady stream of air heated to the most suitable degree, into the boiler, and downwards upon the surface of the water? A valve should of course be affixed to the boiler to discharge the air again from the boiler; that valve being fixed upon a principle of continued action. Perhaps the valve should be kept in action by the engine itself. The hot air would not only purify the boiler of all foul gases, but would accelerate the generation of the steam. I am, yours, obediently,

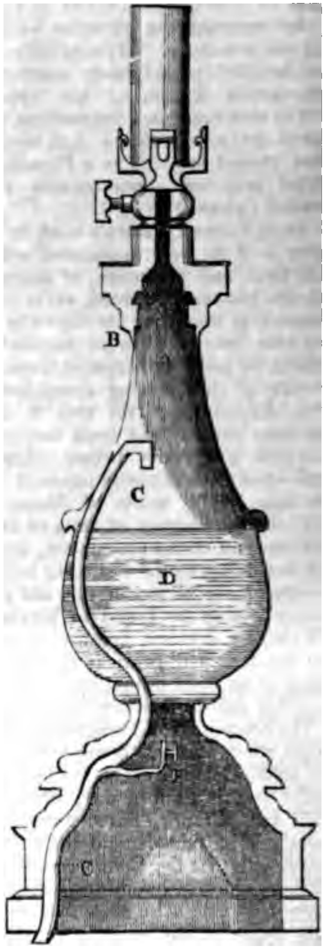
THOMAS DEAKIN.

Blaenavon, April 7, 1842.

NAYLOR'S APPARATUS FOR INCREASING THE ILLUMINATING POWER OF COAL GAS.

Fig. 1.

Fig. 2.



Sir,—I send you a drawing and description of a new piece of apparatus for increasing the illuminating power of coal-gas, which I hope you will insert. Chemists have all allowed that carburetted hydrogen owes nearly all its illuminative power to the accidental admixture of a certain oily vapour which is given off during the decomposition of the coal in the retorts; being aware of this, it occurred to me that if the gas could be more strongly impregnated with a similar compound, the flame would be increased in intensity, *which I afterwards found* to be the case. *The apparatus consists* of a brass reservoir or chamber A, attached to the end of the gas-pipe near the burner. This reservoir may be in the shape of an oil-flask, made air-tight, with a screw-joint B, or other means for supplying it with any highly volatile oil, as turpentine, mineral naphtha, or the hydro-carburets, and should be kept about half-full. Into this reservoir the common gas-pipe C, ascends a little above the oil D; a very small jet-pipe is branched off below this chamber at E for the purpose of applying thereto a minute gas flame, so as to cause a sufficient evaporation from the oil to unite with the gas previous to its being

ed. The whole is of course sur-
l with the usual burner and lamp

nploying this apparatus for burn-
-gas, the intensity of the flame
very considerably augmented;
ently the same degree of light
obtained with a far less consump-
gas, a point which I consider of
nportance. It may be also em-
'or burning those varieties of gas
l by the decomposition of several
species of anthracite, bituminous
wood, &c. which could not be
e employed with any advantage
purpose of illumination. And
ever voltaic electricity be exten-
sed as a motive power, the large
es of pure hydrogen, evolved from
er or platinum plates of the bat-
ight be collected and effectively
d by the new apparatus.
nclusion, I may remark that the
s, from the simplicity of its con-
, might be manufactured at a
ling cost, possessing likewise the
ges of being very compact and
ppearance.

Sir, your obedient servant,

T. W. Naylor.

1842.

L PHILOSOPHY FOR BEGINNERS.*

ordially recommend to all begin-
he study of Natural Philosophy
er young or old—a little work
s been recently published under
e title. It was originally intend-
n explanatory accompaniment to
llent set of educational models
Mechanical Powers, Geometrical
Architectural Solids, &c.) manu-
and sold by Messrs. Taylor and
the publishers of the work; but
s progress through the press, it
y assumed its present enlarged
a complete treatise on the mecha-
vers, illustrated by reference to
s as well as models. The author
uted his task with ability. His
ons are exceedingly simple,
nd intelligible; and his demon-
of principles such as any person with a knowledge of common arithmetic, may readily comprehend. As a Text Book for Schools, or a *vade-mecum*, to persons who must instruct themselves, we know of nothing better in our language. We select a couple of specimens:

The Wedge.

"There is scarcely any instrument whose applications are more numerous than those of the wedge; chisels, nails, awls, needles, axes, sabres, &c., all act on the principle of the wedge. It is also used in a variety of cases where the other mechanical powers would be of no avail. This arises from its being driven principally by *impact;* the momentum of the blow is consequently much greater in comparison to the application of the pressure of the lever. As an example of the enormous power of the wedge, it may be stated that the largest ships when in dock may be easily lifted up by driving wedges under their keels. It has sometimes happened that buildings—such as a heavy chimney for a furnace—have been found to incline, owing to the dampness of the foundation, and have been restored to their perpendicular position by wedges driven under one side. It is sometimes used in splitting rocks, which it would be impossible to effect by the lever, wheel and axle, or pulley; for the force of the blow or stroke shakes the cohering parts, and makes them separate more easily. In some parts of Derbyshire, where mill-stones are obtained from the siliceous sand-rocks, wedges made of dry wood are driven into holes bored round the piece of rock intended to be separated from the mass; these wedges gradually swell by the moisture of the earth, and in a day or two lift up the mill-stone without breaking it. Builders, in raising their scaffolds, always tighten the ropes round the scaffolding-poles by means of wedges driven between the cords and the poles.

"A knife may be considered as a wedge, when employed in splitting; but if the edge be examined with a microscope, it is seen to be a fine saw, as is evident from the much greater effect all knives produce by being drawn along the materials against which they are applied, than what would have followed from a direct action of the edge.

"It appears from the results of some

* al Philosophy for Beginners. Being Fa-
strations of the Laws of Motion and Me-
Intended as a Text Book for Schools and
ction, as a Companion to the Lecture
for Model Schools. Illustrated by 143
on wood. 127 pp. 32mo. London, Tay-
ton.

experiments made in the dockyard at Portsmouth, on the comparative effect of driving and pressing in large iron and copper bolts, that a man of medium strength, striking with a mall weighing 18 pounds, and having a handle 44 inches in length, could start or drive a bolt about one-eighth of an inch at each blow, and that it required the direct pressure of 107 tons to press the same bolt through that space; but it was found that a small additional weight would press the bolt completely home."

The Screw.

"The uses of the screw are innumerable. It is used in coining, where the impression of a die is to be made upon a piece of metal. It is also employed in taking off copper-plate prints, and for printing in general. By its aid a large bale of cotton is condensed into a small package, and from being the lightest and most buoyant of substances, becomes dense enough to sink in water. Sometimes buildings are raised from an inclined to a vertical position, by means of a small screw, acted upon by a comparatively small force. It is also of great utility in astronomical calculations, by affording an easy and very exact method of measuring or subdividing small spaces. An ordinary screw will divide an inch into five thousand parts; but the fine hardened steel screws which are applied to the limbs of astronomical instruments, will go much further. In this case it is called a *Micrometer screw*, from the Greek μικρὸς, little, and μέτρον, a measure. The *gimlet* and *auger* are examples of the screw, both of which may be considered as an inclined plane wrapped round a *cone* instead of a *cylinder*. The power of these instruments is very much increased by their terminating in a point. When liquids or juices are to be expelled from fruit or vegetables, the screw is generally used. The cider press is an example of this machine, so applied; and in cases where great pressure is required, the power of the screw is often employed.

"It is not unfrequently used in flour mills for pushing the flour which comes from the mill-stones to the end of a long trough, from which it is conveyed to other parts of the machinery, in order to undergo the remaining process. In this case the spiral threads are very large, in proportion to the cylinder on which they are fixed. A common corkscrew is the thread of the screw without the spindle, and is used not to correct opposing forces, but merely to enter and fix itself in the cork. Complicated corkscrews are now made, which draw the cork by the action of a second screw, or of a toothed rod or rack and pinion."

VELOCIPEDES—A FEW PRACTICAL HINTS.

Sir,—I have read with much pleasure Mr. W. Pearson's description of his design for a "velocipede," (No. 968,) and as I have been cogitating for some time on the same subject, namely, the applying motive power for carriages (whether that power be manual labour, steam, or other agent) to propellers, to be brought in contact with the ground instead of the cranked axle of the bearing wheels, I may perhaps be allowed to offer some remarks on your ingenious correspondent's suggestion.

I think Mr. Pearson is in error in proposing wheels of so large diameter as 8 feet. Such wheels would be monstrously unwieldy, and the leverage to be overcome would more than counterbalance any supposed advantage to be derived from them. Instance Mr. Brunel's experimental ones on the Great Western Railway, which he was obliged to abandon from the cause stated. I should say that 5½ or 6 feet is the utmost practicable limit for wheels of such a carriage; still retaining, however, the full diameter of 3 feet for the guide-wheel. I think that in general, guide-wheels are disproportionably small. The power expended in lifting the guide-wheel, and all the apparatus at the fore frame of the carriage by every action of the propellers, would detract considerably from the advantages otherwise derivable from them. The simple remedy for this would be to have the propellers 2 or 4 in number affixed to an axle, with the same number of cranks underneath the body of the carriage, leaving the guide-wheel at liberty to apply itself to the use which its name indicates. These propellers should be directed backward at such an angle as practice may determine to be best; and there should be an adjustive apparatus for inclining them to any degree found most convenient, or rather efficient, to counteract shocks. In order also that they may adapt themselves to the inequalities of surface, each propeller should be provided with a spring of strength sufficient to bear a moderate degree of pressure, and which, on meeting with any obstacle, would bear a compression of 3 or 4 inches. This spring might be placed in any part of the

—perhaps the best position would top, uniting the propeller to the A strong spiral spring I think the

iost efficient method of applying the next thing to be considered. t the hands are best adapted to this —applied to the levers in the way use their oars in pulling. Sitting ıral position, with the feet firmly ainst a board, the strength and of the whole man, legs, loins, shoul- . arms, are brought into play; and distributing the exertion equally, hands make light work." The ould both be worked precisely to- s the boatman pulls his two oars at l should describe as small an arc as I think this would be conveniently connecting them by rods to a pair ntal knee-joint levers, in connexion of the propeller cranks. I cannot t give a design of such a carriage to my suggestions, but if your corres- Mr. Pearson, or any of your read- it, I will furnish one with details.

am, Sir, yours, &c.,

GEORGE ROBINSON.

6th February, 1842.

›lan referred to by our correspond- postscript to his letter, we shall be eceive.—Ed. M. M.]

LKER'S HYDRAULIC ENGINE.

I have seen in the *Mechanics' Ma-* ro accounts of a hydraulic machine by a Mr. Walker—the first account Baddeley, the second by a Builder. criber was at Madras in 1822, when a y the name of Wood, made a machine orresponding with Mr. Baddeley's on and drawing. It was for the of drawing water in greater quan- in the usual way, as the ship was ty and heavy laden. The passen- le a subscription for the inventor. is carpenter on board, and the com- his brother. It was spoken of in is at Blackwall at the time, as the considered to have been saved by tion.

›bedient servant,

SAMUEL TOZER.

.-street, Kensington Gravel Pits,
April 7, 1842.

LKER'S HYDRAULIC ENGINE.

In perusing your 971st Number, deley's communication adverting to *'s Hydraulic Engine"* came under my notice—and I now beg permission to lay before your readers a few remarks upon it.

As to there being any advantage obtainable from the peculiar construction and operation of this engine, I consider it a perfect fallacy. The plain facts are these: firstly, that in its first action it is neither more nor less than a lifting pump; and in its second a forcing pump; secondly, that these two operations are required to obtain the result of one action, of either the common forcing or lifting pump—and, finally, that it is only under particular circumstances, and in particular places that it can be applied. The valve being at the botton of the elevator, according to Mr. Baddeley's statement, (by the bye, not the right place after all,) the upward motion of the elevator must consequently have to lift the whole weight of water in that tube above the valve, and I defy Mr. B. to show that this weight of water is in any way counterbalanced (as he says) by the other elevator, while in action: now this is the lifting operation—differing in its results from the common lifting pump in this important particular only, that the lift does not discharge its water, but requires to be forced out by a second motion, namely, the downward stroke of what is termed, the elevator; the water in the well, cistern, or what not, acting, if it has sufficient depth, and consequent resistance—the motion of the elevator being quick, as the piston—and this is the force pump operation. Now, I beg to ask in what does this differ from the common forcing pump? Why, in nothing but the substitution of water (without the slightest possible benefit accruing by it,) for the well-known ram; and here is Mr. Baddeley's "legerdemain"—two well-known operations to be performed, to obtain a result which either is capable, singly, of producing.

There are other disadvantages attending this "*wonder-working*" machine, which, in all probability, hereafter, I shall be required to exhibit.

I am, Sir, your most obedient servant,

JAMES A. EMSLIE.

Newcastle-upon-Tyne, April 2, 1842.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

BENJAMIN AINGWORTH, OF BIRMINGHAM, GENT., *for improvements in the manufacture of buttons.*—Rolls Chapel Office, April 7, 1842.

Six skins of parchment about buttons! To *thread* our way through them is no easy task, even with the aid of the admirably elaborate directions for *threading* given by the patentee—as hard, almost, as finding the

needle in the bundle of hay—but nevertheless, "To all whom it concern, Know ye," that the present improvements relate, firstly, to the shanks of buttons, and secondly, to the backs and faces of buttons.

And first, of shanks—there are seven different sorts described. No. 1 is "a small round, or roundish knob of metal, perforated through the centre with two holes, intersecting, or crossing each other at the centre; the said knob being applied to, and securely fastened to the centre of the back of the button, parallel to the plane of the circular edge or circumference of the front or face of the button. In attaching a button having such a shank to a garment, the sewing-thread may be passed by its needle first through one of the holes of the shank in one direction across the shank, in order to obtain one fastening-stitch, and then through the other hole to obtain another, and so on; the needle may be passed in at one orifice, and out at the next, without going right through, and by thread being so passed, buttons may be very securely attached by sewing; the orifices are to be made bell-mouthed, in order to prevent the thread cutting. That part of the knob which is to be attached to the button is flat, and to be fastened by soldering. The button may be covered with felt, cloth, or other tissue or fabric, the overlapping circumference of the cloth being gathered over all round the turned back border edge of the front shell, so as to overlap into the hollow within that border edge, and the circumference of the concave back shell being then inserted within the same turned back border edge of the front shell, and within the turned over edge of the covering. The pressure which is next exerted on that border edge, and on that of the concave shell back by the dies in the mould, is caused to compass the said edge, so as to fasten the covering, and at the same time to consolidate the front and back shells together into a covered button, made in a mould by dies with pressure, on the plan known to the manufacturers of Birmingham as "Mr. Aston's method;" or the concave shell back may be applied to a front made of mother of pearl, stone, spar, glass, or other suitable material, or porcelain or pottery, the circumference of the concave back shell being, in the last-mentioned case, inlaid into a suitable circular recess or hollow, excavated in the back surface of such front, and fastened there by cement." No. 2 consists of a small tail, divided into two pieces by a saw, and is stated to be particularly applicable to concave shell backs. The divided tail is inserted through a hole in the centre of the button back, the two pieces are then separated, and turned down in the manner called clinching: solder or cement may be applied over the clinched branches, to make all smooth if desirable. No. 3 has a small screw-threaded tail passed through the back of the button, and secured between the back shell and the front part of the button by a small nut. (The two shanks last described are stated to be only applicable to buttons which have "backs formed of concave metal shells," whereas that first described is also applicable to solid metallic front buttons.) No. 4 is a shank which may be cut out, or stamped out, of a piece of metal in the form of a cross; the four arms are then to be "*bended*" up at right angles, and cemented to the button back, offering the same advantages as the others, that the thread need not be passed straight through the shank, but may enter at one hole, and come out at that next it, and so on. No. 5 (a very old acquaintance) is composed of a short piece of oval, or flattened wire, bent into the form of a crescent, or staple, the two ends of which can be soldered to the back of the button. No. 6 is a shank for buttons, made of hard wood, bone, ivory, or mother of pearl; it is formed out of the same piece as the button, and has four holes which are bell-mouthed, to prevent the cotton cutting. No. 7 is a flexible shank for buttons having a concave metal shell back; it is made by perforating the back with a number of holes at equal distances arranged round its centre. Cord, or other suitable material is then passed, "a knot being first made to prevent it slipping through" !—from the inner side of the back to the outside, where it is allowed to form a small loop, and then passed through a hole opposite to that from which it came out into the inside of the back, where it is again secured by a knot, or other suitable fastening, and so on, till a cord has been passed through each hole in succession.

Secondly, of the backs and faces of buttons: The first improvement described under this head, relates to buttons made of porcelain, glass, or earthenware. "The back surface is excavated with a circular recess or hollow, which may be as large as the size of the button will admit, consistently with leaving a substantial border of material all round the outer circumference of the button, for strength, and into the hollow of that circular recess the exterior circumference of a shell back is inserted, and is fastened therein by cement; that shell back may be a concave metal shell with any kind of shank." A similar back, with a flexible shank of cord similar to that before described, may be made of porcelain or earthenware, instead of metal. The next improvement relates to that kind of buttons which are termed stud buttons, or shirt buttons, of which a description is given that

curiosity in its way. Stud but- are told, are "a kind of buttons not permanently sewed or attached rment; but the part of a stud hich answers to or occupies the shank, is inserted into an addi- tton-hole in the garment, for the f fastening the stud button there- ans of such additional button-hole, ead or front of the stud button is hrough the usual button-hole in nt for effecting the intended but- the garment by the stud button." ovement in such stud buttons is ation thereto of fronts of porce- or earthenware. A hollow is he top of a metal stud, into which y cement the porcelain, glass, or re head; the outside rims of the then to be turned over and pressed said face, to hold it fast, or a made in the back of the porcelain, earthenware head, into which the t fits, the porcelain, glass, or earth- such case, overlapping the metal the stud. Another improvement what are known by the term uttons, with flexible shanks made by pressure, with dies, according ston method, before alluded to. tons are, it seems, not commonly that method, with their backs as onts covered with cloth or silk, or terial, being covered so as to con- he metal that is contained in the of the button; but by a peculiar manufacture, for which former tent were granted to the present Mr. Aingworth, on the 30th Au- 1, covered buttons can have their well as their fronts covered; and of manufacture is now carried on signment of the last-mentioned y Messrs. Sanders and Bromsgrove. e metallic shell back, of the usual naking common flexible shank but- a hole of considerable size made its centre, so that the said back fact, a sort of metal collet, and a isc of cloth, silk, or other mate- a small sized hole made in its The cloth is then applied concen- the back or convex surface of the , and is slightly fastened to that y a cement of shell lac. The rt of the cloth, around the small ole, is pushed through the larger e metallic shell, so as to protrude that hole into the interior concavity hell; and the part of the cloth thus caused to protrude, is stuck at interior with cement of shell lac, *verlap a little all round* the circum- ference of the central hole of the shell back, withinside the concavity of that shell. The front and back parts of the button are then to be put together in the usual way.

The claim is—First, to the new kind of metallic shank, No. 1, "applicable to solid metal buttons and to buttons with concave metal shell backs." Secondly and thirdly are repetitions of the words of the first head, but applied to the shanks No. 2 3, 4 and 5 Fourthly, to the new kind of shank for buttons, made of hard wood, horn, bone, ivory, or mother of pearl, which shank is formed in the same piece of material. Fifthly, the new kind of flexible shanks of cord for metal shell backs, which backs are covered with cloth or silk. Sixthly, the new kind of porcelain, glass, or earthenware fronts, for buttons. Seventhly, "the application of fronts of porcelain or earthenware to studs." (*Glass*, though noticed in the description, is not claimed.) And, eighthly, "the application of a covering of cloth, or other material, over the convex surface of the metal shell backs of covered buttons."

William Hirst and Joseph Wright, of Leeds, Clothiers, *for certain improvements in the machinery for manufacturing woollen cloth, and cloth made from wool and other materials.* Enrolment Office, April 7, 1842.

These improvements are stated to consist "in a certain *method* of manufacturing woollen cloth and cloth made from wool and other materials, by a *new process*," of which new process the peculiar feature or result is the addition to cloth already woven, either on one or both sides, or the interposition between two pieces of woven cloth, of a layer or layers of wool (felted merely). Then follows a description of certain machinery by which bats of wool may be felted. The bats are passed between what are called "Platons," (so spelt and so marked by inverted commas in the specification,) and much is said of these "Platons," how they are to be moved in opposite directions, with a "shoggle" between whiles, and how the bats are to be conveyed to and from them, &c., &c. (No doubt *platens* are meant—things common enough, one would have thought, to preclude the possibility of such orthographic and apostrophic blundering.) But how the layers of wool, when so felted, are to be combined with the woven cloth, the patentees do not explain. The machinery described is simply machinery for felting. Neither do the patentees specify, as they were bound to do, in what respects their machinery differs from that in common use; what parts are old and what "improvements." The claim is to, 1. The ma-

chinery described; and 2. To the addition to woven cloth of layers of wool on one or both sides, or between, &c.

MATHIAS NICHOLAS LA ROCHE BARRÉ, OF SAINT MARTIN'S LANE, MIDDLESEX, MANUFACTURER OF COTTON, *for an improvement in the manufacture of a fabric applicable to sails and other purposes.* Enrolment Office, April 7, 1842.

The improvement which is the subject of this patent, consists in forming each warp thread of two or more yarns of cotton, (Nos. 3 to 30 are the sizes of yarn preferred, the thickness and strength, as well as the cost, increasing with the size of the yarn,) twisted together, and each shoot of the weft of four or more yarns of cotton. To make sail cloth, No. 3 yarn is used, and both the warp and weft threads are of two yarns twisted together; for, in this case, it is considered important that both the weft and web should be of the same size and strength. The warp may be worked into any pattern that may be desired. The patentee prefers producing the fabric by raising and lowering equal quantities of the warp thread at each time of forming a shed for the passage of the shuttle, and usually makes the fabric by causing each shoot of the weft to float alternately under and over two warp threads. He is thus, he says, enabled to produce a strong and lasting fabric of cotton, suitable for the making of sails, rick cloths, and such like articles, capable of sustaining the different degrees of heat and moisture to which they are likely to be exposed. If greater strength and thickness are required, a larger number of yarns twisted together, with the same number of warp threads to each inch of the warp, will answer the purpose; if greater strength, without increasing the thickness, more than two yarns twisted together of a larger size of yarn than No. 3, are used. By varying the number of yarns used, and the number of yarns combined in each warp thread, the thickness and strength may be varied as required.

The claim is "the mode of manufacturing a fabric of cotton suitable for sails and other purposes, by applying warp threads, each composed of two or more yarns of cotton twisted together, when combined with the use of weft composed of four or more yarns for each shoot."

ALPHONSE RENÉ LE MIRE DE NORMANDY, OF REDCROSS-SQUARE, CRIPPLEGATE, DOCTOR OF MEDICINE, *for certain improvements in the manufacture of soap.* Enrolment Office, March, 1842.

This invention is stated by our contemporary of the *London Journal* to consist in introducing into soap, manufactured in the usual way, the salts of potash or soda, generally, but more particularly the sulphate and carbonates of potash and soda. These substances are introduced into the soap (when the saponifying process is complete, and it is ready to be cleansed) either in the solid state, in pulverized masses, in the state of crystals, or in the state of crystals melted in their water of crystallization, or else dissolved in steam or water. The quantities of the salts of potash or soda used to every eighty pounds of soap, are 28lbs. of sulphate of soda, and 4lbs. of carbonate of soda or potash, or 2lbs. of each of these last substances; if the substances are used singly, then the quantities are 32 lbs. of sulphate of soda, or 15 lbs. of sulphate or carbonate of potash, or 10 lbs. of carbonate of soda. When the process of saponification is complete, and the soap in a hot and liquid state, is turned over into the cleansing copper, the salts, in the proportions above mentioned, are thrown into it, and the whole thoroughly mixed together; the soap is then removed from the copper and poured into the frames to cool. If the salts are used in a liquid state, they are dissolved in their own water of crystallization, or in steam, or by boiling water, and are the then mixed with the soap, as before mentioned. The patentee claims the introducing into soap, already manufactured, or in process of manufacture, the salts and compounds of potash and soda before mentioned.

COUPLAND'S IMPROVMENT IN FURNACES.

Sir,—I beg to state that Mr. Coupland's principal claim for his improvements in furnaces, consists in the admission of atmospheric air through the grate bars, or perforated plate, after the fuel has been placed upon them, and not to the mere depression and elevation of the grate-bars, as stated in the *Mechanics' Magazine* of the 9th instant, and that the auxiliary apparatus in its present improved state is simple in its construction, and efficient in its operation.

I am, Sir, your most obedient servant,

J. RHODES.

Pond Yard, New Park-street, Borough, April 13, 1842.

[The abstract we gave was quite correct; the bars *are* lowered, solely and exclusively "to enable a fresh supply of fuel to be placed thereon" as wanted. "*Without interfering*," it is true, "with the draught necessary for the combustion of the fuel;" but not interfering with, and actually contributing to, the supply of air, are two different things. To prevent any further cavil on the subject, we subjoin the *ipsissima verba* of Mr. Coupland's claim. "What

ı, the lowering at pleasure, and in a l position by any suitable appara- igh I prefer that hereinbefore des- ı portion of the open fire-bars of a o a position sufficiently below the *able a fresh supply of fuel to be ereon*, and then raising them again ormer position in the furnace, and them there till the fuel is con- nd a fresh supply required, without g with the draught necessary for ıustion of the said fuel while being ned, as aforesaid, and thereby I am ɔo do away with all feeders, hop- bers, plunges, pistons, and inclined ɔd other the like objectionable ap- which have hitherto impeded the l application of inventions for feed- ıces from below upwards."—ED.

NOTES AND NOTICES.

liams's Argand Furnace.—At the monthly ' the Commissioners of the Birmingham , held on Monday last, the committee ap- consider the best means of effecting an of the smoke nuisance, reported that nspected the steam chimney of Mr. Clif- l, in Fazeley-street, to which the patent liams, of Liverpool, had been applied with f consuming the smoke from the furnace, rere perfectly satisfied of the utility of the its efficacy in accomplishing all that was The committee also referred to two let- ı they had received, in reference to Mr. ; invention, from Messrs. Sharp, Roberts, f Manchester, and Mr. Nicholas Knight, ol, which stated that the plan had been ith the most complete success, diminish- nsumption of coal, increasing the quan- ım, and, at the same time, reducing the manual labour. *Midland Counties Herald.*

eric Pressure-Engine.—The *Toulonnais* lowing:—"M. Lewinsky, a Pole by birth, dised in France, will in a few days make atmospheric pressure-engine, in a small ı Admiral Baudin has placed at his com- 'e have before us a certificate by Captain ' the port of Marseilles, affirming that M. in the course of last year made a trial ine, which is of wood, in a flat-bottomed h he was thereby enabled to take out of of Marseilles, and reach the fourth buoy, of between three and four knots an hour, he sea was very boisterous. He had pre- ıde an experiment at Rome, in the pre- numerous spectators; this attracted the he English consular agents, and induced mmunicate an account of it to their go- The Lords of the Admiralty in conse- ote to M. Lewinsky, inviting him to bring tion to England, promising him every and encouragement; but M. Lewinsky, o present his discovery to his adopted eclined accepting the flattering offer."—

Eclip.e of the Sun takes place on the 7th of , during which the moon's shadow will Spain, the South of France, the north of part of Germany. To assist parties desi- bserving this remarkable phenomenon, nomical Society have compiled a Table, which may be had on application at the Rooms,) by which the *path of the moon's* shadow may be traced with very considerable ac- curacy.

Steam Navigation on the Volga.—Although an isolated steam-boat was licensed to navigate the Volga in 1817, no spirit of enterprise was roused until the year 1827. The line between Nishegorod and Astrachan now employs nine steamers, whose engines vary from 69 to 97 horses power. They not only convey passengers and goods, but act as tug boats, and draw after them a barge containing wood as fuel for the machines. The length of the voyage from Nishegorod to Astrachan is between twelve and fourteen days, including their stay at Casan and Saratof; but they are from twenty-five to twenty-eight days on the return voyage, the cur- rent of the stream, and violent winds impeding their progress. The passage money is from 80 to 120 roubles (£6 13*s*. to £5 10*s*.) for the voyage to Astrachan, but about 50 per cent. dearer for that from Astrachan to Nishegorod, and the passengers feed themselves. During the last two years, a new description of passage vessel, worked by machines driven by horses, has been introduced. The steam- boats are private property, and all of them are manufactured by engineering establishments in the province of Vladimir. The cost is from 45,000 to 75,000 roubles, or from £2,065 to £3,430. The iron boats, which are coming into use, cost from 100,000, to 120,000 roubles, or from £4,585, to £5,500; they are dearer, it is true, but are much more durable than vessels of timber, more flat-bottomed, and draw less water.—*United Service Journal.*

Magnetic Binnacle.—We understand that Mr. Payne, optician, South Castle-street, after a series of experiments, which, altogether, have occupied eighteen months, has succeeded in producing a bin- nacle so loaded with magnetism as to counteract the local attraction of the compass in iron vessels. It is pretty generally known that hitherto the mariner's compass has been useless in iron-built vessels, unless they have undergone a process, in- vented by Professor Airey, to "compensate" their magnetism. This compensation, for which the vessel under process is to be continually turned and moored, unmoored and turned again, is very tedious, and, consequently, expensive. It consists in placing large magnets at such a distance from the binnacle, or other compass, that their attraction is equal to the deviation occasioned by the magnetic influence of the vessel. Mr. Payne's plan allows the whole arrangement to be executed in the work- shop, and the invention comprises an entirely new method for the circulation of the magnetic fluid. The exact process is to be kept a secret until a patent be secured; but from the explanation the inventor volunteers, it appears that he collects and fixes a vast quantity of magnetism in his binnacle, and causes its influence to ascend in a conical di- rection towards the centre of the compass needle. The magnetism of the iron vessel is attracted to this magnetic arrangement, which cuts off a direct communication between the needle and the vessel, and leaves the needle as free to act correctly on board the vessel as on shore. The magnetic binna- cle swings on substantial gimbals within an outer binnacle, covered with the usual brass top, lamp, &c. The saving of expense by this new plan will be considerable, and it will not be liable to an ob- jection, which is advanced against Professor Airey's plan, that the compensation is not lasting. It has been found that a variation in compasses, compen- sated on the Professor's plan, arises by the iron of the vessel losing some of its magnetic strength by gradual oxydation, paint, &c.; while the large compens ting magnets remain in preservation, and, after having been exactly powerful enough, become too powerful. The compensating power of the "magnetic binnacle," on the contrary, cannot be too powerful, but may be not sufficiently so, a de- fect which is soon seen, and can, of course, be easily remedied. The first binnacle constructed on this plan is now on board the *Mersey*, iron steamer, plying between Birkenhead and George's Pier,

and occasionally employed as a tug-boat at the entrance of the river.—*Liverpool Albion.*

Blasting by Galvanism.—Mr. Robert's mode of blasting was for the first time in the neighbourhood of Glasgow carried into practical operation in Mr. M'Callum's quarry, adjoining the Necropolis, on the evening of Saturday last. The operations were directed by Mr. Wilson, of the Mechanics' Institution, and the successful result in every instance gave a most convincing proof of the practicability of the application. Some hundred tons of rock were detached: and several practical men who were present, and who previously were sceptical on the matter, expressed their complete conviction that the adoption of this mode of discharge would be more efficient and economical than the common one.—*Caledonian Mercury.*

Iron Steam Frigates.—Yesterday afternoon, a steam frigate, 800 tons burden, was launched from the iron ship-building yard of Mr. J. Laird, North Birkenhead. This is the only large vessel of war which has been built at this port since 1809, when the *Havannah* frigate was built. She will carry 68-pounders pivot-guns, and will be fitted up in all respects like Her Majesty's steam frigates. Her machinery and armament will be completed without delay. The East Indies is said to be her destination. She will make the eighth iron vessel of war which Mr. Laird has built; they all carry pivot-guns fore and aft. Four of them are now in the Chinese seas, namely, the *Nemesis* and the *Phlegethon*, carrying two 32-pounders, and the *Adriane* and the *Medusa*, two 24-pounders. The other three are in the Persian Gulph.—*Liverpool Paper.*

Dollond's New Barometer.—At the last meeting of the Council of the Royal Agricultural Society of England, Mr. George Dollond, of St. Paul's Churchyard, submitted to the inspection of the council an improved barometer for ascertaining the changes of atmospheric pressure. The improvement effected by Mr. Dollond in this important meteorological instrument, not only obviates many of the common difficulties incidental to mountain-barometers, and when out of use and packed up, becomes as firm and secure as a walking-stick, but it embraces in its construction many of the advantages of the stationary barometer or weather-glass, as an indicator of changes taking place in the weight of the atmosphere. This improvement is chiefly attained by a most ingenious contrivance in the arrangement of the mercurial cistern, and the application, for the first time, of an air-tight stop-cock, for regulating the passage of the mercury into the cistern, or enclosing it securely within the tube. Mr. Dollond states the following as the principal advantages resulting from this arrangement:—1. A true and certain state of altitude in the column of the mercury from the highest to the lowest situation on the globe, without the necessity of applying the uncertain and tedious corrections required in ordinary barometers. 2. The uniformity of the observations, arising from the free and unobstructed condition of the mercury; all the advantages of the open cistern barometer being thus attained without the attendant difficulty of arranging the starting point of measure. 3. The entire exclusion of air from the inner tube or cistern, and the consequent preservation of the surface of the mercury from oxidation. 4. The application of this new arrangement is capable of application to barometers of any diameter, and with exclusive advantages obtained by no other mode. 5. The perfect security in carriage, when the barometer is either out of use, or required to be conveyed from place to place. The council ordered their best thanks to Mr. Dollond for the favour of this inspection.

Steam Ploughing.—The Highland and Agricultural Society of Scotland have again offered a premium of 500*l*. for the first successful application of steam to the cultivation of the soil. No premium was awarded last year, and the committee announce their intention of withdrawing the notice after the present year. The particulars with reference to the premium may perhaps be interesting to some of our readers, and we therefore subjoin them:—"A premium of five hundred sovereigns, or such other sum as the directors may see proper in the circumstances, will be awarded for the first successful application of steam power to the cultivation of the soil. By the cultivation of the soil are to be understood the operations of ploughing and harrowing, or preparing the soil in an equally efficient manner, and the other purposes for which animal power is now used; and the success of the invention will be judged of in relation to its applicability to the above purposes in the ordinary situations of farms in this country, and to the saving in *time*, *labour*, and *outlay*, which it may possess over animal power, as now generally employed in the cultivation of the soil."

Liverpool Mechanics' Institution.—This institution appears to be by far the most extensive and prosperous establishment of the kind in the kingdom, and is effecting an immensity of good in the large and important community in which its operations are carried on. The buildings devoted to the purposes of the institution cost 15,000*l*.; it contains upwards of 3,300 members, with 850 pupils in three day schools, and 600 pupils in fifteen or sixteen evening classes. There are fifty teachers regularly employed, whose salaries amount to 5,000*l*. a year; a library of 9,000 volumes with 1,600 readers, and a daily distribution of 200 books. The public lectures are delivered twice a-week, and are attended by audiences varying from 600 to 1,300. The total receipts for carrying on this extensive machinery, amounted last year to 6,939*l*. 18*s*. 6*d*. The evening schools afford instruction in English, writing, arithmetic, mathematics, mechanical philosophy, navigation, astronomy, botany, naval architecture, mechanical, landscape, architectural, and ornamental drawing and painting, together with modeling and practical perspective. At the last exhibition of the Liverpool Academy, there were eight paintings by teachers in the institution, and twenty one by artists who were formerly pupils within its walls. There are also day schools in connexion with the institution, in which a comprehensive system of education is carried on, adapted to the age, capacities, and pursuits of the pupils. The extra classes comprise instruction in chemistry, natural philosophy, the French and German languages, classics, vocal music, &c.—*Midland Counties Herald.* [The Liverpool is what the London Institution—the older of the two—might have been and would have been had the views of the founders not been most unfortunately thwarted.]

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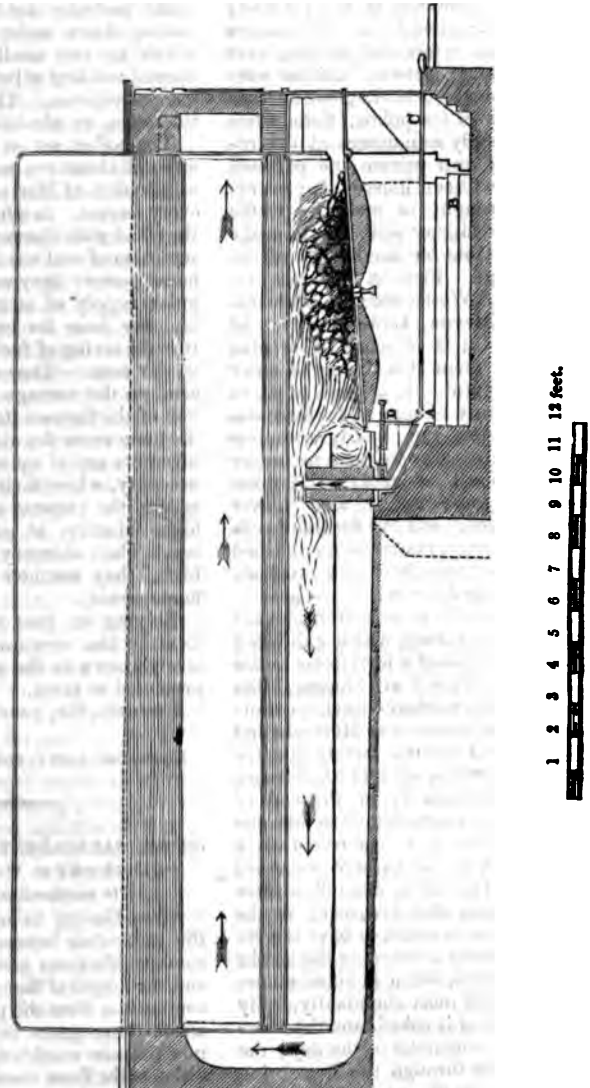


MESSRS. LILLIE AND SONS' BOILER FURNACE.

MESSRS. LILLIE AND SONS' BOILER FURNACE.

Sir,—Without desiring to impugn the general correctness of your censure of the late Leed's Smoke Report, I must, nevertheless, make a claim on your candour for the allowance of one (at least) remarkable exception to it. The parties who laid plans before that meeting were not *all* "smoke doctors;" neither were they all patentees, outbidding one another for the favour of the public. Some there were who simply communicated the results of their own private and personal experience, without hope of fee or reward—who sought to make no traffic of their knowledge or skill, but to make it freely available for the benefit of the public at large. First in this class (according to Mr. West's order of enumeration,) were Messrs. Lillie and Son of this town, and it is in behalf of the plan submitted by them that I beg to enter the present appeal. It appears to me to be an eminently simple and efficacious plan—combining the nearly complete prevention (I suppose we must no longer say *combustion*,) of smoke with great economy of fuel; but it was "never before published," and but for this Leeds meeting might never have been published at all. So far, therefore, you must allow the meeting did good.

The plan, as will be seen from the accompanying engraving, which exhibits a longitudinal section of a forty horse boiler and furnace, erected at Messrs. Lillie and Son's works in Store-street, (a similar one may be also seen at Horrocks and Co.'s, Preston,) consists merely in a regulated admission of air into the furnace through the passage A, at the end of the ash-pit B, (immediately before the bridge). A rod C is connected to a valve by which the air passage is opened and closed. The air is allowed to flow in for four hours after first firing in the morning. This is stated to have the effect of completely consuming the smoke during this period, when it would otherwise be given off most abundantly. By this time the coal is coked, and the valve is shut for the remainder of the day; the air which passes through the bars being then sufficient for the combustion of the carbonized fuel. They supply the furnace with fuel only at starting in the morning, when they put on sufficient to work the engine throughout the day. They make no clinkers, and only a very small proportion of ashes, which are let out by the slide D. The whole of the front of the firing end of the boiler is made perfectly air-tight, there being folding doors under the dead plate, in which are two smaller doors, which are opened and shut at intervals, as the steam-gauge requires. These doors regulate the steam, by admitting more or less air.

The boiler, set on this plan, has been at work about ten months, to the entire satisfaction of Messrs. Lillie and Son in every respect. In a former furnace which they had with Stanley's feeder, the consumption of coal was 20 lbs. per hour per horse power; they now have a more regular supply of steam, from 13 lbs. of coal per hour for each horse power, so that the saving of fuel is, in this instance, 35 per cent. They estimate it at 20 per cent. on the average. The cost of erection of the furnace itself is pretty nearly the same as on the old principle; but the inventors are of opinion that there is no necessity, where their method is employed, for the expense of erecting the very high chimneys at present generally in use. Their chimney, which is 30 yards high, they consider sufficient for 500 horse power.

Relying on your willing co-operation to make this very useful plan as extensively known to the public as it is freely presented to them,

I remain, Sir, your constant reader,

H. H.

Manchester, April 7, 1842.

ON THE MANAGEMENT OF FURNACES AND BOILERS—BY C. W. WILLIAMS, ESQ.

[In continuation from p. 294.]

Sir,—Having in my last pointed out the connexion between the quantity of combustible gases generated in a furnace, and the length of flame produced by their combustion from the proper admission of air to those gases behind the bridge, I now propose considering the actual condition of the flues, the character of the products of combustion which they contain, and the temperature of those products. The main object in this examination, as regards practical information and improvement, is, the ascertaining, first, whether we

from any given weight of fuel, all : which it is capable of giving out? ondly, whether the entire, or what of the heat so obtained, is turned rative or other purposes; in other how much of the available heat is applied, and how much is lost? re the cardinal points in the inquiry; hese we obtain but little informa- m books. Until, however, these s shall be satisfactorily answered, anifestly idle to draw conclusions : efficiency of a furnace or boiler, vaporative power of any descrip- fuel, from the consideration alone rater evaporated.

1 has been written on the subject areas, surfaces, and mechanical ions of furnaces and boilers; and ve been condemned or approved, m their relation to the degree of on in which combustion is effected, quantity of heat generated, taken wasted, but by reference solely to but a secondary result, namely, ntity of water evaporated. It is e increasing this quantity is the ractical end in view; but we are aking of the mode of estimating antity in reference to the fuel em- : my object, therefore, is to show til we have ascertained the quantity wasted or misapplied, we are not sition to draw any inference from rtion which may be usefully em- Were we convinced, that all our ments and processes are so com- hat the coal is enabled to give its heat, and the water to absorb it amount of evaporation might then en as a correct exponent of the surfaces, and proportions of air s and boilers, and the merits or ts of any system of combustion. rily, however, referring certain to certain proportions, we assume y objects of the inquiry, and the ta on which the whole depends, us commit the practical error of down rules and giving formulæ ulations (as Tredgold and others one) which must necessarily be as tive and uncertain, as the assumed 1 which they are based.

t these two divisions of the subject : only distinct, but even frequently d to each other in practice, may be by showing that the amount of *ation may continue the same*, under processes in which the quantities of heat generated may be essentially different; or, that the same quantity of heat under one arrangement may produce a much larger evaporative effect than under another. The weight of water evaporated, or in other words, the quantity of water taken up by the water, so far, indeed, from being a certain or adequate criterion of efficiency in a furnace or boiler, is in truth but one only of those incidents from which our calculations and inferences are to be drawn, and is not entitled to credit when taken apart from those others which have equal claim to consideration. This lumping sort of process however—this estimating the effects of many combining, or even adverse causes, from a single result—has much retarded our progress towards obtaining that correct estimate of details from which alone a safe conclusion may be drawn. Until we are enabled to distinguish and appreciate the several varying results, giving to each its due measure of cause and effect, we are but floundering in the dark, and on a wrong road, without any chance of arriving at the wished-for end.

With respect to the first point—whether we obtain the full measure of heat from the fuel employed, this is a purely chemical question: as, however, the heat developed will be in the ratio of the perfection of the process of combustion, the visible inspection which I suggest will go far to enable us to form a very accurate estimate on this head.

If the flame passing from the furnace exhibit a uniform state of activity, and a clear white colour, we may be assured that the combustion of the coal gas is complete; the atmosphere in the flues will then be transparent, and the fuel may be considered as giving out its full measure of heat.

On the charge of coal being thrown on, the evolved gases should, at once, become ignited, if the air be properly administered. The interior of the flues will then exhibit an increasing flame (as shown in my last communication) until it is from 20 to 30 feet in length, instead of Tredgold's standard of 6 feet. Mr. Dewrance, engineer of the Liverpool and Manchester rail-road, states, respecting a boiler furnace to which the air is properly admitted, and which is 3 feet square—"We have a clear flame along the flues to the distance of 30 feet from the

fire, and the flues at this distance are quite hot: previously, this part was quite cold."

On the charge being about half exhausted, and when the mass on the bars begins to assume a red glowing appearance, a visible change frequently comes over the whole, which is here worthy of notice, as I have not seen it alluded to by others. This change is caused by the manner in which the charge of coal burns in the furnace. If equally and uniformly, the clear internal atmosphere will continue undisturbed—no smoke will be produced, and the combustion of the gaseous matter will remain perfect to the end. If, however, the coal burn partially, or into holes, leaving parts of the bars uncovered, the flame will then be altered, and from its previous white and flaky character, it will assume a reddish cloudy appearance—the atmosphere in the flues will no longer be transparent, but will become hazy or dark—smoke will be generated—the eliminated carbon will be deposited along the flues and boiler plates, and, by its non-conducting character, seriously influence the evaporative effect. The deposition of carbon will instantly be detected by its coating the bulb of the thermometer.

Now this derangement of the process of combustion cannot be detected, or even supposed to exist, except by internal inspection, and by the aid of sight-holes and thermometers; for on looking in at the door, the furnace and its contents exhibit an active glowing state—the change I have described, and the production of smoke, only showing itself when the door is shut. The interior appearance, however, of the flues, and the fall of the thermometer, (which we know must be accompanied by a diminished evaporative effect,) at once sets us right, and contradicts the deceptive appearances in the furnace—proving, incontestably, that we are not then obtaining the entire heat which the fuel is capable of giving out.

If allowed to continue, the evil consequences rapidly increase. The fuel burns away still more irregularly, and a considerable loss of heating effect will follow, quite sufficient to derange all calculations or results, although no indication of the kind will be discovered by looking in at the doors.

These injurious effects are occasioned solely by the partial admission of the air through the little craters or holes in the burning mass, and the uncovered bars, in larger quantities than is consistent with the conditions under which the gaseous matter enters into combustion, or these can be chemically disposed of at the moment of its admission. Such unequal quantities of air, though entering in at the hottest part of the furnace, not only carry away much heat, but, by cooling, the evolved gases below the temperature of chemical union and action, convert them into true smoke.

The disease being discovered, the remedy at once suggests itself, and is as simple as it is scientific—namely, fill up those holes or cavities in the burning mass with fresh coal, or equalize it on the bars, and thus prevent the partial admission of the air. Either expedient will at once restore the previous clear white flame and transparent atmosphere in the flues, and again raise their temperature. Here we have a further proof of the value of these sight-holes and means of internal inspection; for not only have they indicated the nature and cause of the derangement, but the effectiveness of the remedy. Without this visible proof, indeed, who would have supposed that the throwing a little fresh coals into these holes in the burning mass, would have had the effect of stopping the generation of smoke—checking the fall of the thermometer and raising the temperature of the flues? An observant fireman will soon appreciate and correct these changes: but there can be no law or regulation for preventing such evils, since the irregularity with which the fuel burns will depend on many casual circumstances, as, the peculiar burning quality of the coal—the unequal size of the lumps—a mixture of different sizes and kinds—the irregular formation of clinkers, or careless charging. Attention to these matters will give no trouble, if the means of interior inspection be supplied: but without it, the master, as well as the fireman, will be perplexed by results for which they cannot account—finding the chimney smoking, and the evaporation diminishing at the very moment when they least expected it. Under such circumstances, the evil will be attributed to any thing but the right cause: for as well may we pretend to describe what is taking place in a room from which we

all light, as to discover what is ›lace in the furnace or flues, with- means of looking in.

ıave now to consider the second, ually important point—whether ıre of the heat supplied by the is usefully applied by the boiler? en supposing we are satisfied on t head, and that combustion is ›ly perfect, we are still as far as om being in a position to deter- ıe efficiency of boiler, furnace, or ıtil the amount of escaping, or ıt, be correctly ascertained, an which I have frequently found much as one-third of the entire hich might be obtained from the Jnder such circumstances of pal- ss, it would be as irrational and re, to measure the evaporative any coal or boiler, without taking ount the quantity of waste heat, uld be to measure a liquid without the loss by leakage or overflowing essel employed. We have there- ascertain the absolute tempera- the escaping products, and the of their current; yet these are which are most neglected in or- practice. On the practical bearing part of the question, being the ion of the heat applied or lost, the g table, indicating the tempera- the escaping gaseous matter, will us with some useful facts:—

	Thermometric temperature.	Length of flame in feet.
e	466	10
ntes	462	14
	490	18
	508	22
	518	26
	524	26
	528	28
	534	28
	540	28
	540	28
	540	26
	536	24
	524	24
	508	22
	494	22
	486	20
	476	18
	468	14
	464	14
	460	12
	460	10
ge	460	10

have here the relative tempera- *the escaping products* after hav- ing made the circuit of a cylindrical boiler, (see *Mech. Mag.* No. 971,) 15 feet long, taken at a distance of 48 feet from the furnace. The thermometer had its bulb inclosed in a protecting tin tube, and inserted through an iron plate which covered the flue. The tube was introduced only so far as kept the temperature below 600°—the entire range, as we see in the table, being between 460° and 540° or but 80 degrees.

So far as the rate of progression, in two minute time, during a charge which lasted forty minutes is important, the result may be depended on: the absolute temperature of the gaseous escaping current was, however, considerably beyond what could be indicated by the thermometer, and was ascertained to be from 200° to 250° beyond what is stated in the preceding table. This fact was determined beyond all question, by means of the melting points of a series of metallic alloys prepared by Dr. Kane, after an extensive series of experiments specially undertaken for the purpose. By these metallic alloys, inserted into the flue, it was found that the escaping stream of heat was at least 750°.

Under such circumstances, could there be a doubt that a body of heat was absolutely lost, quite sufficient to defeat any calculation? And would it not therefore have been deceptive to the last degree, to draw any inferences from the mere weight of water evaporated? One thing was certain, namely, that the fuel employed gave out its full measure of heat in other words, its combustion was complete. Another thing was also equally certain, that we had not the means of absorbing and usefully applying that heat. The question then remains, What quantity of heat was lost? What was its evaporative value? And how can it be turned to evaporative purposes? These shall be considered in a future communication.

I am, Sir, yours, &c.

C. W. WILLIAMS.

Liverpool, April, 17. 1842.

THE DISC ENGINE.

Report of Josiah Parkes, Esq., C. E., on the comparative trials of a Disc and Reciprocating Engine.

Having been requested to conduct a series of comparative trials with a Disc and Reciprocating Steam Engine, I submit the following statement of the results obtained.

These trials were made at the works of Messrs. Nasmyths, Gaskell, and Co., Patricroft, near Manchester. They were conducted in the presence of a member of their firm, of their superintendent, Mr. Wilson, and of two of the patentees of the Disc Engine.

The object proposed being to ascertain, with the utmost possible accuracy, the relative quantities of water as steam, and, consequently, of fuel, which would be required to enable each engine to perform the same amount of work, it was a matter of the first importance to determine upon some work which would oppose an uniform resistance. after much consideration, I selected that which is presented by fans revolving at high velocities; considering that these machines, when driven at an uniform rate of motion, would offer a resistance so nearly invariable as to satisfy this primary condition. The Christmas holidays fortunately admitted of fans being appropriated entirely for this purpose, so that no extraneous circumstance interfered to change the nature, or amount, of the work during the trials.

The Reciprocating Engine was made by Messrs. Nasmyths, Gaskell, and Co. It is a beam engine, thoroughly well constructed, in excellent condition, and in every respect unexceptionable as a specimen of its class. I found the diameter of the cylinder to be 14½ inches; the length of stroke 2 feet, 2¾ inches; and the number of double strokes of the piston, during the trial, averaged $41\frac{6}{10}$ per minute.

The Disc Engine (called 16 horses' power) I found to have a steam chamber of 27 inches in diameter, and the mean number of revolutions effected, during its trial, was 118½ per minute. With these proportions, and at these respective speeds, the volume of steam which should pass through each of the two engines in a given time, as defined by the transit of the parts on which the steam acts, is very nearly the same; an equality which must be considered as tending to satisfy doubts as to the results of the trials having been affected by any other circumstances than those strictly arising out of the principles on which the two engines are constructed.

Both engines were alternately supplied with steam from the same boiler. This I found to be very deficient in the extent of surface exposed to heat, and the setting was ill arranged; consequently, the proportion of water evaporated for the coal consumed was low; but, as I adopted on this, as on former occasions, the mode which is considered to afford the only accurate means of ascertaining the expenditure of steam for a *given effect, viz.*, that of determining the *consumption of* water as steam, the results obtained are free from all question which might otherwise arise as to the capability of the boiler, or the quality of fuel made use of.

The two engines, being thus supplied with steam under identical circumstances, were employed, on alternate days, to drive the same fans at similar velocities.

It was found, by previous trials, that with the quantity of steam the boiler would conveniently produce, the Disc afforded a greater amount of power than the Reciprocating Engine; therefore the number of fans driven, their velocity, and the discharge of air, were so adjusted as to provide for the resistance being within the capability of the latter engine; and thus I was enabled to keep the fans revolving at a very uniform velocity throughout both trials. This velocity was accurately indicated by a counting apparatus connected with an intermediate shaft between the engine shaft and the fans.

The two engines were of the non-condensing class, and discharged their steam into the atmosphere.

For the registration of the water a vessel was provided, which was found to contain 338 lbs. by weight; and it was arranged for the whole of the water used during the trials to be measured by means of this vessel; and the boiler being furnished with a glass gauge, I endeavoured to have the same pressure of steam, and the same quantity of water in the boiler, at the conclusion, as at the commencement of each experiment. In this I succeeded within a variation of ½ an inch in the level of the water, for which due allowance was made.

The weight of coal burnt during each trial was also accurately ascertained; the fire at the conclusion being, as nearly as possible, in the same state as at the commencement.

Having thus taken the precautions I considered requisite to obtain results worthy of confidence, and having made some preparatory trials with each engine, the fans were connected with the Reciprocating Engine and they were driven without intermission for six hours. During this time the quantity of water as steam which passed through the engine was 10,406 lbs., equal 1734⅓ lbs. per hour; and the coal consumed was 20 cwt., equal 373⅓ lbs. per hour; the evaporation being in the low ratio of 4⅗ lbs. of water for 1 lb. of coal. The counter actuated by the intermediate shaft registered during this trial 14,301, the greatest difference in the velocity of the fans during any hour being about 6 per cent., and the mean speed of the engine 41·6 strokes per minute.

On the following day the fans were connected with the Disc Engine and driven for 5 hours and 57 minutes, when the counter, connected as before, had registered 14,318,

being 17 more than on the previous day; the greatest difference in the velocity of the fans during any hour being little more than 1 per cent. The quantity of water as steam required to supply the engine was 8,697 lbs., equal 1449½ lbs. per hour; and the coal consumed was 16 cwt., equal 298⅔ lbs. per hour; the evaporative ratio being about 4⅞ lbs. of water for 1 lb. of coal. The mean number of revolutions of the engine shaft per minute was 118½.

Immediately after the conclusion of this trial, the fans were again connected with the Reciprocating Engine, and the same velocity being given to them, an indicator diagram was taken off which, by comparison with the diagrams of the preceding day's trial, showed that the resistance overcome by the Disc Engine, was somewhat greater than by the Reciprocating Engine, but the difference was very small.

In order to ascertain the amount of effective power exerted by the Disc Engine, I availed myself of Mr. Davies' Dynamometer. The principle of this very complete instrument is, that the force of the resistance taken on the periphery of a driving drum or toothed wheel on the engine shaft, is denoted on the dial-plate of a spring balance, so placed that its index may be easily observed whilst the engine is at work. The engine being stopped, standard weights are suspended from the drum or wheel until the index of the spring balance marks the same degree at which it stood on the dial-plate during the action of the engine; and the velocity and circumference of the drum or wheel in feet being also known, true data are obtained for determining the work performed. By means of this apparatus—which I consider to be worthy of the utmost confidence—I found the mean resistance, or load, actually overcome, to be equal to 17 horses' power. Although this instrument was applied only to the Disc Engine, yet as it defined the resistance overcome by each, it indicated with equal truth, the effective power exerted by the Reciprocating Engine. The Dynamometric observations were further corroborated by the diagrams obtained on applying the ordinary indicator to the Reciprocating Engine, when driven without a load and when performing the same work. The indicator was verified by comparing the pressures marked by this instrument with those of a mercurial gauge acted upon by steam at various densities. The quantity of water as steam required by the Reciprocating Engine being 1734½ lbs. per hour, and the effective power exerted equal to 17 horses, the water consumed is in the ratio of 102 lbs. for each horse power, per hour; and the water required by the Disc Engine being 1449½ lbs. per hour, this is in the ratio of 85¼ lbs. per horse power per hour. Thus, the consumption of steam, and consequently of fuel, for equal effect, by the Reciprocating, is upwards of 19 per cent. greater than by the Disc Engine.

The mean pressure of steam in the cylinder of the Reciprocating Engine, as exhibited by the indicator diagrams, was equal to 25¼ lbs. per square inch, and the mean pressure in the chamber of the Disc Engine, as exhibited by a mercurial gauge constantly connected with it, was 23¼ lbs. per square inch.

The above effects were obtained by the two Engines when working unexpansively and with steam at comparatively low pressures. As regards non-condensing Reciprocating Engines, I have not previously met with any (and I have conducted experiments, similar to the foregoing, on many engines of this class) which has required less than 120 lbs. of water as steam per horse power per hour, even when using steam at high pressure, a fact which establishes the excellence of the Reciprocating Engine subjected to trial, as it only consumed 102 lbs. per horse power per hour.

The results of these trials are thus exhibited in terms of the quantity of water as steam actually expended in overcoming the same resistance by the two engines, and, also, according to the conventional phrase of *horse power;* but that quantity was greater in both cases than would have been required, had the steam pipes and cylinders been coated. Though, however, these were uncovered and a considerable quantity of steam must have been condensed, which had no share in producing the effect, the relative results are unaffected by this circumstance, as I found, that a nearly equal extent of surface (about 45 square feet) was so exposed in both cases.

When experiments of this kind are conducted in a manner liable to little error, evidence of their accuracy will arise from independent sources, and we possess direct means of verifying the correctness of the principal results obtained, viz., that the Reciprocating required 19 per cent. more steam than the Disc Engine, for equal effect.

The counter informed us that the Reciprocating Engine made in the 6 hours 14978$\frac{4}{10}$ double strokes, which multiplied into its capacity* (passages, &c. included) gives a total of 78,726$\frac{4}{10}$ cubic feet, as the volume of steam which passed through the cylinder at the absolute pressure of 40 lbs. per square inch. The ratio of the volume of water contained in that steam is as 1 to 677.

* The passage equalled 0·405 cubic feet.—Total capacity, 5,256 cubic feet.

The capacity of the Disc Engine* was also exactly ascertained; it was filled and evacuated $42{,}322\frac{3}{10}$ times during the 5 hours and 57 minutes; and the total volume of steam expended amounted to $69{,}535\frac{1}{4}$ cubic feet, having a mean absolute pressure of 38 lbs. per square inch, for which the ratio of the elementary water is as 1 to 710. By comparing the quantities of water given by this method of computing the respective consumption of each engine, it appears that the Reciprocating would necessarily require $18\frac{3}{4}$ per cent. more water than the Disc Engine, which confirms the correctness of the two experiments.

There are still a few points which I feel called upon to note, as they affect, to a certain extent, the results of the trials.

The Disc Engine was quite new, and therefore its acting surfaces were not in that high state of polish I have seen in those which have been in constant use for many months. Thus somewhat more power would be consumed in overcoming its own friction in this case, than in older engines. On the contrary, the Reciprocating Engine had been at work for a period which had brought its rubbing surfaces into a perfect state. The Disc Engine, also, was planted, temporarily, on the wood floor of an upstairs room being simply bolted down to sleepers; and the manner in which the driving strap was obliged to be rigged, for the purpose of the trial, increased the friction of the engine shaft on one journal. Though the practicability of such an arrangement exhibits a property of much importance to the employers of engines, viz., the small mass and cost of foundation necessary for the Disc Engine, yet, it is unquestionable that the circumstances referred to were adverse to this engine in a comparison as respects economy.

I have already alluded to another circumstance which was adverse to the economy of both engines, viz., the surface of steam pipe, and &c. exposed to the influence of the air in the building, and amounting to about 45 square feet. By experiments on a large scale, and pursued for a lengthened period, which I have made with steam under similar circumstances, and at similar pressures to those used on this occasion, I have found that 1 square foot of cast-iron pipe will condense fully 1 pound of steam per hour. Thus, about 270 lbs. of water should be respectively deducted from the consumption of the Disc and Reciprocating Engines, as those quantities had no share in the production of the effect. Making this deduction, it comes out that the effective horse power was really obtained with $82\frac{6}{10}$ lbs. of water as steam, per hour, by the Disc Engine, and with $99\frac{3}{10}$ lbs. by the Reciprocating Engine.

In concluding this statement of the results attending an investigation alike interesting and valuable, as regards the practical facts elicited, I must express my entire confidence in their accuracy, checked as my observations were throughout by so many competent persons, all of whom were most diligent in guarding against error during both trials. I am not acquainted with any experiment in which the same load, without the slightest change in any part of the intermediate gearing, has been made the medium of deciding on the comparative merits of different steam engines; and had I to choose again, I do not think a resistance could be selected subject to so little variableness as the fans adopted on this occasion. This kind of resistance offers peculiarly accurate means of noticing the quantity of irregularity occurring in the speed of any engine. The uniform velocity obtained by the Disc Engine was very apparent, and struck me as a property of no small importance as regards its application to various purposes, for which an equable rate of motion is a desideratum.

I am, Gentlemen, your obedient servant,
(Signed) JOSIAH PARKES.

12, Great College-street, Westminster,
February 3, 1842.

P. S. In compliance with a suggestion of the patentees, I have visited several of the Disc Engines on which I made a series of experiments in January of last year; I have, also, communicated with all the gentlemen employing these engines which then came under my notice. The engines referred to have now been working upwards of eighteen months, and in addition to my own perception that they are in perfect order, I am informed, in reply to my applications, that they have been in operation with constant regularity, also that the cost of repairs during the above period, had been so trifling as to be unworthy of mention.

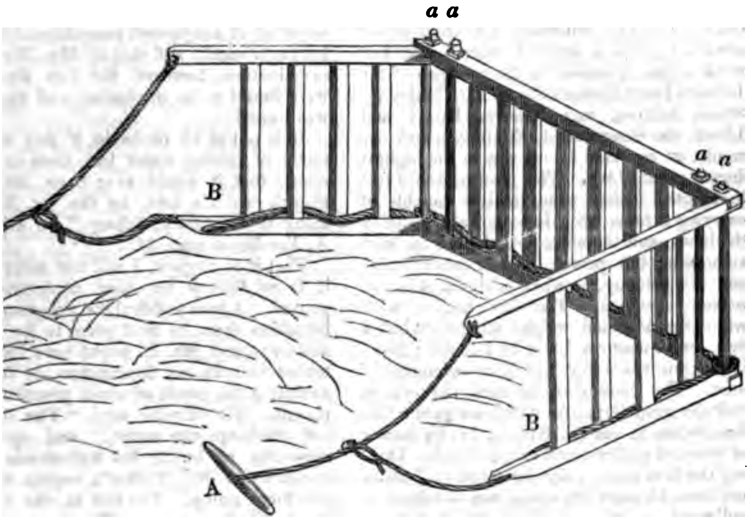
J. P.

* Disc capacity, 1·643 cubic feet.

HAY SWEEP.

Sir,—With this you will receive a rough model of an instrument used in the north of England in hay-making, and which they call a hay sweep. The description that accompanies the model is, I think, sufficiently clear for *any rough carpenter* or *wheelwright* to make one by, and the cost of the one I saw was only 25*s*. The machine from which I made this model was drawn by two horses, which were driven by two men, who, each placed one

ere the letter B is, and another the rope to keep it down, and the horses with long reins. To emselves steady, they rested their n the top rail, one looking to the right, and the other to the left, to guide their horses; but I think, if there was a sufficient weight attached to, or fixed *on* each end, that there would be no occasion for any one to stand there;



ses might then be led by even two

ink this would be an exceeding machine in all moderately level s, and, although it has been used ny years in the north of England, r saw it elsewhere.

main, Sir, your obedient servant,

M. S. R.

Description.

s machine should be made of oak, where the uprights, *a a a a*, d those (four) should be of iron; ottom parts, with flat or round let in neatly, so that the bottom be quite level, and the tops fasten-screws and nuts.

top and bottom rails are 4 inches or 14 inches circumference. Length back or centre part 8 feet; ditto h side or wing 4 feet 6 inches; all round, 3 feet 6 inches. The ides, or wings, are so fixed as to backwards or forwards by turning e *outward* iron bars, which pass through holes, thereby affixing the wings to the centre. These iron bars should be *round*.

A *strong* rope is interlaced through the rails near to the bottom, and that is connected with the top by a smaller rope; and at each end is a splinter bar A A, to which a horse is affixed.

This machine is of great service in catching weather, when your hay is nearly made, and when to prevent its being wetted by sudden rain, you wish to get it up in large cocks. The present plan to accomplish this, is by the men pushing it up with forks, but by the machine more may be got up in *one hour* than *many* men would be able to do in a day.

Where the rick is made in *the same field*, or in one of several *hay* fields *adjoining each other*, the time and trouble of carting is saved, for, by this machine it may be drawn up at once to the place where the rick is to be made, and only two horses are required.

THE DISC ENGINE AND CAPTAIN CARPENTER'S PROPELLERS.

noticed some time ago the scientific ements adopted in the fitting out of am frigate *Geyser*, and also the adaptation, which was in progress, to the pinnace of the vessel, of one of the well-known disc engines and of the steam propellers invented

by the commander of the Geyser, Capt. Carpenter. The advantage expected from having the pinnace thus equipped was, that she might be able to tow the other ships' boats, against wind and tide, into shallow harbours and rivers where an armed force might be wanted, but which the vessel herself could not, from her draught of water, penetrate. Two trials of this auxiliary pinnace steamer were made last week on the Thames, in the presence of Sir Edward Parry, Comptroller of Her Majesty's Steam Marine, and Messrs. Ewart and Lloyd, the Government Engineers, and the result, as reported to us, was in the highest degree satisfactory. The pinnace is 30 feet in length, 9 feet wide, and is capable of carrying 8 tons. She is remarkably bluff in the bows, and therefore not adapted for high velocities; but power (a *little* power only) and not velocity, is what is aimed at in the present instance. The disc engine with which she is fitted weighs altogether but 6 cwt., and measures 3 feet by 1 foot 6; leaving ample space for a full complement of men. The connexion between the engine and the propellers (of which we gave a full description in our *No.* 844, p. 18) by means of grooved pulleys, and catgut bands. During the first trial, a regular speed of 7 miles per hour *through the water* was obtained, as indicated by Massey's log, although from the unfavourable shape of the boat, a wave of nearly 18 inches deep was carried before the bows. The velocity of the engine-shaft was 200 revolutions a minute, and more than that is not, we understand, desired from the propelling shafts. In the second trial, the pinnace drew after her at about the same rate of speed, a regular gun-boat, furnished with cannon, and a complement of fifty men, with their arms and ammunition. The engine and boiler are so fitted to the pinnace, that they can be taken out in five minutes, and replaced ready for operations in the same brief space of time.

WALKER'S HYDRAULIC ENGINE.

Sir,—Walker's hydraulic engine is deservedly attracting great attention, and the better it is understood, the more it will be admired. Your last Number (975) contains three papers, in two of which Mr. Walker's invention is adverted to rather disparagingly. The first is a rival, (S. P.,) who favours us with a modification of the "powder puff pump" of the sixteenth century. "The spiral wire, tube of mackintosh cloth, or of leather," bespeak the ephemeral character of such a machine, and stand little chance with a competitor which threatens to last almost *for ever*—and a day. "S. P." has seen *Mr. Walker's* machine, but from the concluding paragraph of his "description," he evidently has not yet mastered its *modus operandi*.

Mr. Tozer (page 315) endeavours to prove a want of novelty, by bringing forward the contrivance of a Mr. Wood. Mr. Walker's Belgian patent was at first refused in consequence of a supposed resemblance between his contrivance, and that of Mr. Wood; on examination, however, the two inventions were found to be *dissimilar*, and the patent was passed.

It is not at all probable, if this excellent mode of raising water had been once hit upon, that it would ever have been lost, though we are told, by the by, that the thing is a "perfect fallacy;" so saith Mr. A. Emslie, at page 315.

That it is *perfect*, I will not assert; that it is *no fallacy* has been incontrovertibly proved. I have watched the progress of this invention from its first germ to its present maturity, and Mr. E. might have been contented to take my description, or to bring against it the result of some practical experiment. Mr. Emslie says, "The lift does not discharge the water," and upon that reasoning he builds his hypothesis of the similarity of Mr. Walker's engine to a lift and force pump. The fact is, *the lift does discharge the water!* This is seen plainly enough in filling Mr. Walker's glass elevators; it is also shown by making the down *stroke* so slowly as to be inoperative, when the *up stroke* performs its own peculiar office. The fact is also shown by filling the elevators, and removing them from "the water in the well cistern, or what-not," when their contents are still delivered without any aid from the "consequent resistance."

Mr. Emslie further says, "I defy Mr. Baddeley to show that this weight of water is in any way counterbalanced by the other elevator, while in action." Mr. Emslie's defiance will not induce me to undertake the part of showman; but Mr. Walker has shown to thousands, and, I dare say, will show to thousands more, that which Mr. Emslie cannot comprehend. The mode of demonstration resorted to by Mr. Walker, is simply to detach one of the elevators from the beam; on working the machine, the quantity of water then raised is just one-half, *but the labour is nearly doubled!* On refixing the elevator, and working the machine, the quantity of water is doubled, and the labour reduced as before, affording the most unequivocal proof of the advantages of the equilibrium to which I alluded in your 971st Number.

Mr. Emslie may depend upon it there is more in Mr. Walker's hydraulic engine than was ever dreamed of in his philosophy, and

these circumstances he will not be d to exhibit *the other disadvantages* ing this "*wonder working*" machine. never Mr. Emslie can produce a lifting ing pump, which, worked by one man, ith a twenty feet lift, raise one hun- allons of water per minute—then, but l then, will he be in a position to com- ith that which he "considers a *perfect* *t*."

re is no violation of any of nature's n Mr. Walker's engine, but he has red to employ a principle hitherto but ly available; all that has been pub- respecting it is the result of *actual* *ig*, free from all theoretical or specu- ideas, and writers may as well attempt y the laws of gravity, or of falling , as to gainsay the performances of momentum engine."

all who can, I would say, "see it;" se who cannot, I would merely say, eve those who have seen it."

I remain, Sir,

Yours respectfully,

W. BADDELEY.

lfred-street, Islington,
April 19, 1842.

WALKER'S HYDRAULIC ENGINE.

—It will probably have been observed parties most interested, that to obtain eatest effect from a given power, the y of Walker's hydraulic engine should de to depend upon the number of os- ons made by water in an inverted n of the same length as the lift.

Your obedient servant,

S. Y. (An Engineer.)

l 16, 1842.

TUTION OF CIVIL ENGINEERS.—MI- TES OF PROCEEDINGS OF SESSION, 2.

February 15.

the Mode practised in India for ob- ing Solid Foundations for Bridges, , in Sandy Soils, by Means of Wells." *Captain Goodwyn, B.E., Assoc. Inst. E.*

ing for the foundation of buildings rs to be entirely unknown in Hindos- the ordinary mode of securing a found- where the super-stratum is tenacious, ests upon loose sand, is to dig a well water is reached; a curb of timber is placed, and upon it a cylinder of brick, t exterior, and 3½ feet interior diame- s built to the height of 3 or 4 feet the ground. As soon as the masonry ardened sufficiently, the well-sinker fixes a plumb-line to the top of the cylinder as a guide, and descends withinside, carrying an instrument called a "Phaora, or Mamooti," somewhat similar in shape to a hoe; with this he excavates the earth until the water is too deep; he then commences the use of the "Jham," which resembles the "Phaora" in shape, but is about 36 inches long and 27 inches wide, and is suspended to a cord passing over a pulley above the cylinder. Upon this instrument the well-sinker descends, and diving into the water excavates with the "Jham" the soft earth under the sides of the curb, and is at intervals drawn up with the instrument. The cylinder descends gradually from 6 inches to 2¼ feet per day, as the earth is withdrawn from beneath it, and relays of workmen keep it constantly going, lest the sand should settle around it, and cause it to hang up. The natives are very expert in this operation, and not unfrequently remain under water more than a minute at a time. The cylinders have been sunk as deep as 40 feet; but with extreme labour.

A series of these wells being sunk at intervals of 1 foot between them, they are filled with a grouting of lime and rubble-stone, and separately arched over; arches are then thrown transversely from the centre of each parallel pair, and another set of arches turned over the adjacent wells longitudinally; the whole is then covered with masonry, and the pier or other building raised upon it: such foundations are found to answer perfectly in situations where almost any other kind would be washed away.

The communication was accompanied by a drawing of the process, and of the tools used, showing also the modification of the system proposed by Colonel Colvin, of the Bengal Engineers, for obtaining foundations for a curtain, or line of wall, by sinking square masses of brickwork, with two or more wells in each, through which the workmen could excavate the soil.

In answer to questions from the President, Captain Goodwin observed that the greatest peculiarity of this system was that the sinker worked under water: such had been their custom for ages. Upon this kind of foundation, many of the large fortresses in India were constructed, and they stood remarkably well; whereas if timber piles had been used, the white ant would have destroyed them in a short time.

Lieutenant Sale observed that another main reason for not using piles was, that timber was scarce and dear, whereas labour was plentiful and cheap. Hence the general use of the brick cylinders.

Mr. Parkes conceived the most ingenious parts of the proceeding to be, the sinking through the water, and thus avoiding the risk of bringing up large quantities of sand, and the combination of arches, for distributing the weight of the superstructure equally among the brick shafts. Such shafts had been used by the Chinese, and sunk in the same manner from time immemorial.

In answer to a question from the President, Mr. Simpson described the process now so much practised for sinking wells through bad strata by means of cast-iron cylinders; excavating the earth from within the cylinder by an instrument called a "miser," which is a conical iron shell with a valve opening inwards: it is suspended by iron rods 1¼ inch square, and worked from the level of the ground without pumping up the water: it is not uncommon to excavate to a depth exceeding 100 feet in that manner. The "miser" can bring up a cube yard of earth each time it is raised. Cast-iron cylinders are preferable to brick shafts, which frequently hang up, and in that case give much trouble, whereas if the iron cylinders do not descend freely, they will bear the application of considerable force to drive them down. They are frequently forced through the indurated ferruginous gravel. Light planking is also sometimes used, particularly in such cases as in the well he is now sinking at Chelsea, which is 20 feet square, lined throughout with 3-inch planking. It has reached the quick sand at a depth of 32 feet, and will be stopped there.

Mr. Davison had just completed a well at Messrs. Truman and Hanbury's brewery, with cast-iron cylinders, 8 feet diameter, and 193 feet deep, an account of which he promised to present to the Institution.

The President was now sinking a set of cast-iron cylinders through sand which was liable to be washed away; they were to be filled with concrete, and used as the foundation for a lighthouse at the Point of Air. An account of the construction was, he believed, preparing for the Institution.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM NEWTON, OF CHANCERY-LANE, CIVIL ENGINEER, *for certain improvements in engines to be worked by gas, vapour, or steam.* (A communication from a foreigner residing abroad.) Rolls Chapel Office, April 14, 1842.

"The process constituting this invention consists in submitting ether or volatile liquors to the action of heat in order to convert them into elastic vapours, and cause them to act on the piston of an ordinary engine, and when they have produced their effect, in condensing them to their liquid state, in order to introduce them again into the generators, that they may be a second time converted into vapour, which may act on the piston of the engine, and so on successively. To produce these objects, two methods may be employed. One consists in producing or generating and employing gases and ether at so trifling an expense that they may be allowed to escape into the atmosphere after having operated on the piston of the engine. The second method consists in producing a given quantity of the agent, and employing it over and over again in a machine constructed in such a manner as to prevent the loss and escape of any particle of the same. The second method is preferred, as the expense of employing ether and volatile liquors would otherwise be an obstacle to their being used. The heating and vapourizing of the ether, or other volatile liquor, requires a boiler of a peculiar construction, and a condenser of a novel construction is necessary for reducing them from the gaseous to the liquid state, after they have produced their effect on the piston; and further, a new or improved apparatus is required as a substitute for the stuffing-boxes. This apparatus exerts an elastic pressure on the rods which are to move without any escape of vapour, which pressure may be increased or diminished at will, and any escape of vapour effectually prevented. The facility with which ether and volatile liquors are converted into vapour when submitted to heat, and also their inflammability, render it impossible to expose them to the direct action of fire, as an explosion might be produced by the sudden generation of a great quantity of gas; water and steam must therefore be used as a medium for transmitting heat to them."

The patentee afterwards explains that the substances which he proposes using as "substitutes for steam," (of water) are "sulphuric ethers, hydrochloric ether very pure, and with reference to volatile liquors, ammoniacal gas, which liquifies with great facility." "The ether employed," it is added, "ought to be very pure, otherwise it would corrode the boilers and cylinders."

A description of a boiler follows, (illustrated by numerous drawings) which it is said will "answer the purpose very well." It consists of two parts; first, "an external boiler, which receives the direct action of the fire;" and second, "an inner boiler, which contains the motive agent." The second boiler communicates by means of a pipe with a condenser, "into which any superabundant quantity of gas is conducted when the pressure exceeds the prescribed limit."

The working cylinders are of the ordinary

ter the ethereal vapours have done
r there, they pass through an educ-
, to a series of pipes surrounded by
r, where they are recondensed, or,
words, reproduced in a state fit for
use.

new and improved apparatus," to be used "as a substitute for the uffing-boxes," and on the hermeti-ness of which the efficiency of the fair entirely depends, is thus des-omitting the references to certain re drawings which accompany it): cover or upper plate of the cylinder gine carries a cone, which is fixed ate by its base. Over that cylinder ylinder is placed, the cover of which carries a cone. The piston-rod rough both cones. A leather, satu-th oil or fatty substance, and thus ant, is rolled in a spiral direction piston-rod and cones. This leather only by a tape or twine, which is ound it in a helical direction, to it from unrolling. Between the d the internal sides of the cylinder space which must be filled with or oil. A reservoir contains the employed in the operation; and pipes for conveying the oil as ed by a pump into all parts of the s. There is also a reservoir of air ed by the liquid forced by the pump, t of which is to render the pressure A valve is provided for the escape perfluous oil; which valve is loaded s of a lever and weight, and is fur-ith a funnel and pipe for reconduct-the first reservoir the oil which es-rough the valve. A meter is added ompressed air principle, for indicat-ressure produced on the stuffing-is by the indications of this instru-t the engineer regulates the degree re which the weight ought to produce lve."

order to place the leather on the d, a rod of the same diameter is l, and on this rod the leather is to , having the edges previously pared, pared, and perfectly smooth on one s edges. Then roll it with the hand enly as possible on the rod, so that nd round and round two or three The leather thus rolled is retained s of a tape coiled round it. These ions made, the cover of the small is removed, the piston being then ottom of the other, (the larger or) cylinder. Then place the extremity od on which the leather is wound n the *top of the piston-rod*, and slide r *gently from one rod to the other*. The leather descends until it reaches the cone, (of the working cylinder) which being very sharp at its upper end penetrates a certain distance into the circular cavity formed by the leather, and slightly distends the leather. The cover of the small cylinder is then put over the piston-rod, and as it descends to its place, the cone (attached to it) enters into the cylindrical cavity of the leather. The bolts are then tightened gradually, and the cover of the small cylinder brought carefully into contact with the working cylinder, when the leather covers both cones."

The above substitute for a stuffing-box may, it is said, "be used not only in the before described (gas) engine, but also with any steam engines actually in use."

A contrivance is described for "lubricating the piston when necessary;" and also "a cock or a valve, to be used instead of the ordinary cock for retaining very volatile fluids."

The patentee desires it to be understood "that the boiler containing the water and steam which transmits heat to the ether and volatile liquors, and converts them into vapour, should be provided with safety-valves, water-gauges, proof-cocks, and all other accessaries, generally adapted to steam generators."

No claim is made. The public are left to gather from the description given what "the improvements" are which the patentee considers to be new; and this is a sort of labour which the Courts have decided a patentee has no right to cast on the public. The double boiler we do not think is new. The substitute for the ordinary stuffing-box is new, and, moreover, a very ingenious contrivance, which, though it may never be of any use in its native application to ethereal vapour engines, may probably be applied with advantage to high-pressure *steam*-engines. The patentee (or, more properly speaking, the foreign author of "the communication" to him) gives us to understand in the introduction to his specification, that he has actually succeeded in obtaining a motive power from ethereal vapours "employed over and over again in a machine constructed in such a manner as to prevent the loss and escape *of any particle of the same;*" but that the machine he has described is capable, even with its ingenious packing apparatus, of accomplishing such a prodigy, or even of reaching within many degrees of it, we hold to be a most chimerical expectation. There could not fail to be very great waste; and, according to the inventor's own showing, unless there is no waste at all, there is nothing to be gained by the adoption of his machine.

Moses Poole, of Lincoln's-inn, Gent., *for certain improvements in fire-arms.* (Being a communication from a foreigner residing abroad.)—Enrolment Office, April 16, 1842.

The improvements comprehended under this patent relate solely to fire-arms with revolving breeches, and consist, 1. In so constructing them that by simply pulling and letting go the trigger, one barrel is discharged, and the next in the circle of barrels brought round to be fired off; so that the gun may be discharged as many times as there are barrels, without once moving it from the shoulder; and 2. In making the locks of such fire-arms without either hammer or cock.

When the trigger is pulled, it pushes forward a small spring barrel or case, which by means of a connecting collar and link, brings a moveable stop inside of the revolving breech round upon the nipple of the first of the loaded barrels in order to be fired, and by its forcible contact with the cap fixed upon it, causes it to explode. On withdrawing the hand from the trigger, the spring barrel and stop return to their original positions, while the breech, with which the trigger is also connected, (by means of arrangements similar to those commonly adopted in guns of this class, and not necessary therefore to be here described,) revolves so far as to bring up another loaded barrel ready to be discharged in the same way as before. Should it be desirable to cease firing after the discharge of one or more barrels, there is a stop below the lock, by pressing on which the whole of the mechanism is made fast.

The claim is, "1. To the mode of constructing fire-arms with revolving breeches in such manner that the action of pulling the trigger will discharge the gun, and by withdrawing the pressure therefrom, the breech will revolve, and bring up a fresh barrel to be discharged, the other parts returning to their original position.

"2. To the mode of constructing fire-arms with revolving breeches applied thereto, in such manner as to dispense with the cock or hammer, by bringing each nipple having a cap thereon, successively in contact with a moveable stop, which will explode and so discharge the gun."

NEILSON'S HOT-BLAST PATENT—IMPORTANT TRIAL.

Jury Court, Edinburgh—April 1—5.

J. B. Neilson and others, v. *Househill Coal and Iron Company.*

[*The Lord Justice Clerk* and a special jury commenced to try the issues between the parties on Friday, 1st of April, and so extensive was the investigation, that the case occupied six days.]

This was an action of damages for the contravention of a patent for "an invention for the improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required." The claim of the patentee is in these terms:—"I, the said J. B. Neilson, do hereby declare, that my invention for the improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required, consists in introducing into, and applying to the fires, forges, and furnaces, atmospheric air, in the following manner, &c."

The following were the issues:—

"It being admitted, that, on the 1st day of October, 1828, the pursuer, J. B. Neilson, obtained letters patent under the Great Seal used in Scotland, in place of the Great Seal thereof, and duly enrolled a specification in terms of the proviso contained in said letters patent:

"It being also admitted, that the pursuers, other than the said J. B. Neilson, have acquired, by assignment from him, a joint interest with him in the said patent:

"Whether, in the course of the year 1840, and during the currency of the said letters patent, the defenders did, in or at their iron works at Househill, by themselves or others, wrongfully, and in contravention of the privileges conferred by the said letters patent, use machinery or apparatus substantially the same with the machinery or apparatus described in said specification, and to the effect set forth in the said letters patent and specification, to the loss, injury, and damage of the pursuers?"

The damages were laid as follows:—Profits claimed, as at the date of the action, 10,000*l.*; other damages, as at the same date, 2,000*l.*—Total, 12,000*l.*

Mr. Rutherford opened the case for the pursuers in an address of upwards of two hours' duration. The following among other witnesses, gave evidence in favour of the pursuers:—

- Professor Forbes, Chair of Natural Philosophy in University of Edinburgh.
- W. Gregory, Esq., Professor of Chemistry, King's College, Aberdeen.
- Dr. Andrew Fyffe, Lecturer on Chemistry, Edinburgh.
- George Buchanan, Esq., Civil Engineer, Edinburgh.
- David Mushett, Iron and Mine master, at Coleford, Gloucestershire.
- William Jessop, Esq., of the Butterly Iron Works, Derbyshire.
- Alvan Penrice, Esq., Mining Engineer, Workington Hall, Cumberland.
- Alexander Christie, Esq., of the Muirkirk Iron Works.
- John Holdsworth, Esq., of the Coltness Iron Works.

eorge Bodmer, Esq. Engineer, Manchester
a Silverwood, Esq., Civil and Mining En-
r, Derbyshire.
der Buttery, Esq., of the Monkland Steel
ron Company, &c. &c.

Solicitor General (M'Neill) then
d the jury with great ability for the
s, and afterwards called several wit-
chiefly from London).

Rutherford replied for the pursuers
quent and powerful speech.

Lord Justice Clerk, after giving full
as to the jury as to the law of the
nt over the principal parts of the
. In concluding, he informed the
it, if their verdict should be for the
s, they would simply find for them
e issues; if, on the other hand, they
ind for the pursuers, then he consid-
would be expedient, with a view to
-procedure in this important cause,
y should embody in their verdict
to the three following questions:

ether the invention, as described in
letters patent and specification, is not
ginal invention of the pursuer, the
B. Neilson?

ether the description contained in the
cification is not such as to enable
n of ordinary skill to make machinery
ratus capable of producing the effect
in the said letters patent and speci-
?

ether machinery or apparatus con-
according to the description in the
ers patent and specification, is not
lly useful for the purposes set forth
id letters patent?"

ury, after retiring for an hour and a
returned a verdict for the pursuers,
e issues, at the same time adding,
of the suggestion of the court, the
g special findings:—

I further find, that by the description
id specification, the patentee did not
any particular form, or shape, or
f construction, of the air vessel or
or receptacle or receptacles, in which
ander blast is to be heated.

d further find, that by the use of the
effect" in the specification, the pa-
did not state that the form and shape
air vessel, or vessels, were material
purpose of heating the air in such
el, or vessels.

d further find, that the terms of the
ation respecting the air vessels, or
cles, and the size and numbers there-
not such as to mislead persons ac-
d with the process of heating air, so
rect and cause them to construct the
in a form or manner contrary to the
y and necessary rules to be attended
ating air, passed into vessels for the
purpose of being heated under the progress
of the blast.

"And they assess the damages at 3060*l.* sterling."

[It was proved in evidence, that the defenders, from the time they began to smelt iron, to the date of the summons executed against them, had smelted 1700 tons of iron, so that the sum of 3060*l.* of damages is at the rate of 1*l.* 16*s.* for every ton of iron smelted by them.]

NOTES AND NOTICES.

Impure Air.—Dr. Reid, in his lectures on chemistry, mentions the following simple and satisfactory experiment for the discovery of impure air:—A spoonful of lime should be injected into a beer bottle with water, and being placed where suspicion is attached to the quality of the atmosphere, the presence of impurity would be tested by the appearance on the surface of a white and copious incrustation.

English and American Tools.—All kinds of moulding planes, more particularly beads, hollows, and rounds, are cheaper in the United States than in England, in consequence of machinery being employed in manufacturing them, to a considerable extent. With these exceptions all other edge tools are dearer in the United States than they are in England. Axes made in England of the American pattern and quality, would pay well as an investment to take out: they may be purchased at 6d. per lb. The best axe and hammer maker in New York is an Englishman, named Standish, in Perry-street—his price is 3 dollars for a broad axe of 9lb.; this is the lowest. The felling axe, of about 6lb., sells from 1½ to 2 dollars. One reason why the American axe is superior to those imported, is because the steel is welded to the end of the iron, instead of being put between two layers of iron, as in England, by which it is apt to peel, when using the axe sideways.—*Le Cras.*

New Salt.—M. Laurent announces that he has obtained a new salt, the "isato-sulphate" of potash, by treating isatine with the bisulphate of potash. This salt presents a new type of crystals; it is isomeric with the indigo-sulphate of potash, but it possesses different properties. Acids give a precipitate of isatine, and disengage sulphurous acid.

Feeding Poultry.—Professor Gregory, of Aberdeen, in a letter to a friend observes—"As I suppose you keep poultry, I may tell you that it has been ascertained that if you mix with their food a sufficient quantity of egg-shells or chalk, which they eat greedily, they will lay, *cæteris paribus*, twice or thrice as many eggs as before. A well-fed fowl is disposed to lay a vast number of eggs, but cannot do so without the materials for the shells, however nourishing in other respects her food may be; indeed a fowl fed on food and water, free from carbonate of lime, and not finding any in the soil, or in the shape of mortar, which they often eat off the walls, would lay no eggs at all with the best will in the world. Lay this to heart, and let me know in the spring if the hens lay two, or two for one."—*Liverpool Standard.*

Science in High Life.—A letter from Dublin of the 16th instant, written by a gentleman who was present on the occasion of casting a gigantic speculum which has been undertaken by Lord Rosse (late Lord Oxmantoun), and quoted in the *Times*, says—"Nothing could be more successful than Lord Rosse's operation, nor more beautiful than all his arrangements. The casting was made at nine at night of yesterday, (15th inst.) and byten we witnessed the building up of the monster speculum of 6 feet diameter, and weighing 3 tons, in a h

oven, built expressly to contain it, and where it will remain for the next two months, which time will be necessary for that gradual cooling process to which it must be subjected. It is fine thing to see a man of Lord Rosse's station, instead of applying a strong mechanical genius, as is often the case, to nick-nackeries, at once attacking the most important and arduous problems, and forwarding the highest branches of science. During the very delicate and difficult experiment of yesterday, he was perfectly cool and decisive, and amidst various suggestions from the bystanders, quietly followed his own judgment, which was better than any of them. His present achievement, should it finally prove quite successful, is of the greater value, since the mere expense is quite beyond the reach of an ordinary professional man. This last operation, after having satisfied himself of the manner and practicability of each part of the proceeding, could not have cost him less than £1,000. If the final result proves satisfactory, which there seems no reason to doubt, he will have reached, in the opinion of scientific men, the *maximum* of effect that is attainable, since the eye, as they affirm, could not make use of a larger speculum than about 6 feet diameter."

Great Colliery Tunnel.—The Victoria Tunnel, constructed for the conveyance of coals from the Leazes Main Colliery, and Spital Tongues Colliery, to the river Tyne, near the Glass House Bridge, Ouseburn, has been completed, after a labour of two years and ten months. The tunnel, which extends under the Barras Bridge down the Dene, is two miles and a quarter long, and seven feet six inches high; it has been constructed, at a great expense, by Messrs. Porter and Latimer, the owners of the Leazes Colliery, to enable them to ship their coals on the Tyne. The engineer is Mr. Gilhespie, who has displayed great skill and perseverance in conducting this great undertaking to so successful and satisfactory a termination.—*Mining Journal.*

Electric Dyeing.—Mr. Baggs has discovered a method of applying the oxides of various metals to the purposes of dyeing cotton cloths by the agency of electricity. He showed, last week, at the Polytechnic Institution, an experiment or two to prove the practicability of his invention.

Experiments with Jeffery's Adhesive Composition.—Amongst the numerous inventions submitted to the Lords Commissioners of the Admiralty, and referred by their Lordships to the Committee of master shipwrights recently sitting at Woolwich dockyard, was a composition to be used in place of the substance with which vessels are at present caulked, to render them water-tight. The experiments ordered to be made by the master shipwrights to ascertain its value when applied to the purpose for which it is intended, and the result, are interesting and satisfactory. Two pieces of African teak, a species of wood difficult to be joined together by glue, on account of its oily nature, had a coating of the composition applied to them in a boiling state, and in a short time afterwards bolts and screws were attached to each end, the joined wood placed in the testing frame, and the power of Bramah's hydraulic engine applied to the extent of 19 tons, when the chain broke without the slightest strain being susceptible where the joining took place. A larger chain, of one inch and a half in diameter, was then applied, which broke with a strain of 21 tons, the joint in the wood remaining apparently as firm as at first. The utmost strain the cement can bear in this form, therefore, remains to be proved when experiments are made with larger chains. Four pieces of hard wood were then joined together, weighing in one piece 44 cwt., and carried to the top of the shears in the dockyard, a height of 76 feet, from which it was precipitated on the hard granite wharf wall below, without any of the joints yielding in the smallest degree. The result of these severe tests induced the Lords Commissioners of the Admiralty to communicate with Lieutenant-General Sir George Murray, G.C.B. and G.C.H., for the purpose of making experiments with it in the marshes, by bringing the full force of cannon balls against it. Accordingly, a number of planks of oak 8 inches thick and fir 16 inches square were joined together with the cement, to represent 8 feet in height and eight feet in length of the side of a first-rate ship of war, without any thing else in the shape of bolt or security to assist the composition; and it was, on Tuesday, set up as a target at the butt in the marshes. Three new 32-pounder guns were placed at 400 yards distance or point blank range, and three shots fired. The effects were wonderful, tearing the wood to pieces, and in only one instance, where the joint had not been good, showing that they had any effect upon the cement, so as to separate the joined parts from each other. A hole six inches and a quarter in diameter was then bored in the centre of the target and a 32-pounder shell inserted, and exploded by a match, which tore the wood to small splinters without in many places in the least separating the composition. This new invention is said to possess the power of expanding like India rubber in warm climates, and will not become brittle under the coldest temperature.—*Times.*

Magnesian Cement.—The valuable properties of magnesia, in the composition of hydraulic cement, were first brought to the notice of the Madras Government by Dr. Macleod, and applied in reparations of the fort in 1825. About a twelvemonth afterwards, a comparative trial was made between a cement of the calcined mineral mixed with sand, a cement of lime and ironstone, and common chunam plaster, applied to portions of the same wall. After a heavy monsoon the magnesian cement was found to be the hardest and strongest of the three; and was thought to be fully equal to Parker's cement. The price at which the two cements could be procured at Madras was then equal; but, chiefly in consequence of the discovery of large deposits of the magnesia on the banks of the Cauvery, near Trichinopoly, the magnesian cement can now be produced at less than one-sixth of its cost at that period. A claim to the discovery of this mineral was made a few years ago by Col. (now General) Pasley, who was unacquainted with Dr. Macleod's experiments; but on an investigation of the matter, made by the authorities in England, the claim of the latter gentleman was clearly proved, and a handsome donation of 3000 rupees was made to him by the East India Company.—*Lieut. Newbold.*

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USEUM, REGISTER, JOURNAL, AND GAZETTE.

o. 977.] SATURDAY, APRIL 30, 1842. [Price 3*d.*

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

Fig. 1.

HOLCROFT'S PATENT PORTABLE SAFETY BOAT OR PONTOON.*

To a people so eminently and essentially maritime as the English nation, an invention which gives additional safety to mariners and others, who are led by the necessities or the vicissitudes of life to traverse the ocean, cannot fail to be regarded with deep interest by the whole community.

The vast increase that has taken place of late years in the numbers of those who daily seek that occupation and subsistence in the cultivation of land in the colonies which are denied to them on their own soil, renders it a matter of the highest importance to ensure to them during their passage to the distant shores of Australia or the Canadas, a greater degree of safety than now unfortunately has been found to exist; so that in case of any sudden disaster at sea, and whilst distant from any human aid, the mariners may be able to command within their own vessel the means for ensuring an escape from the horrors of a death by drowning, or the still more horrible one of destruction by fire.

The instances, far too numerous to particularise, which are on record of the loss of human life at sea, arising from the destruction of ships by fire or water, offer one melancholy reflection to the observer—namely, that the majority of these fatal occurrences have been the result of an insufficiency of boats, wherein the crew and passengers could seek a temporary refuge; and it has hitherto been found totally impossible to remedy this evil, inasmuch as the bulkiness and unaccommodating form of the boats at present in use render it a matter of difficulty to find safe stowage even for the scanty and limited number that are at present to be found on board of merchant and passenger ships. The consequence of this inadequate supply of boats has been, in most cases where the number of passengers and crew has exceeded that which the boats could contain, to occasion the most awful and desperate struggles for priority in obtaining a place in the boats; which has in some cases ended in the swamping of the boats, from the multitudes that rushed into them in the hope of escaping death: or else in a catastrophe still more frightful to contemplate, namely, the violent ejection or murder of the weakest, in order to lighten the overburdened barque—as was seen not very long ago in the case of the American ship *William Brown*, the crew of which saved themselves in this horrible manner at the expense of the lives of those whom they were bound to protect and to save, even to their own detriment.

It needs, therefore, no very elaborate exordium to prove that at the present the principal reliance for the safety of those who "go down to the deep in ships," is more in the protection which a gracious and ever-merciful Providence is always ready to afford his creatures, and in the goodness of the ship, and skilfulness in the mariners, than in any hopes of escape by means of the boats which are carried on board emigrant and merchant vessels. The invention, therefore, of a boat which should combine portability, capacity, lightness of draft, capability of being contained in a small compass, and unconquerable buoyancy, and which to those essential qualities should add that of being economical in its construction, both in materials and labour,—has long been a desideratum.

Many persons have obtained patents for inventions within the last fifty years, purporting to be boats for the preservation of life in shipwrecks and storms; and the four quarters of the globe have furnished those who have engaged in the endeavour to construct such a boat, with models of various degrees of merit: but hitherto, notwithstanding the numerous efforts that have been made, nothing which can really claim to be successful has as yet been achieved. The Greenlander, the Esquimaux, in common with the fisherman of the Coromandel coast, have furnished their leathern skiffs, or their fibre-sown massoula boat, as models; and the results, as exhibited in the life-boats of Captains Manby, Basil Hall, and many others, have been so far good that they have replaced the clumsy fabrics that were formerly in use for the purposes to which they are applied. Still there remains to be overcome the hitherto insuperable difficulty of furnishing a cheap, safe, light and portable boat, which shall serve the purposes of the mariner

* Patent dated October 28, 1841; Specification *enrolled April 28, 1842.*

engaged on distant voyages, and ually at the service of the fresh- sailor, or finally be adapted to the ant services so often required by ops in the passage of torrents and during a march through an un- or hostile country.

invention which is now offered to iblic will, it is hoped, supply the table deficiency which is above to exist; and, as the number of who seek for food and employment tant colonies is, owing to the con- and progressive increase in the po- n, yearly multiplying in numbers, it becomes a matter of the highest importance to provide additional means for their safe passage across the ocean, or, at all events, for their temporary safety, in case of accident to the vessel which conveys them. The great difficulty in the way of providing an adequate number of boats for the safety of crew and passengers, has hitherto been, as already intimated, the unwieldiness and bulkiness of the boats at present in use. There can, according to the present mode of constructing them, be no more boats carried in every merchantman than can accommodate from forty to sixty persons;

Fig. 2.

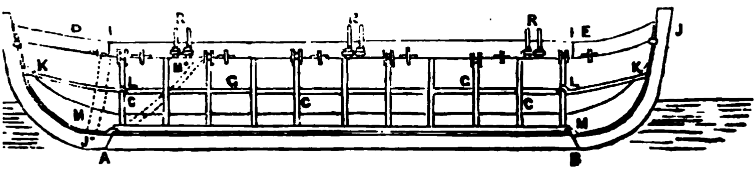


Fig. 3.

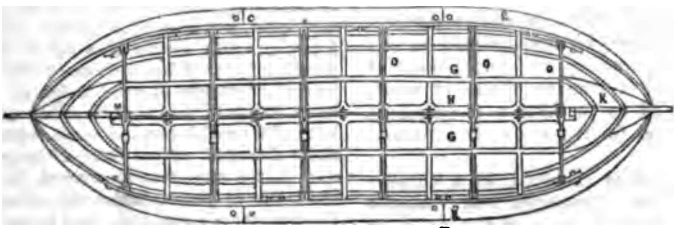
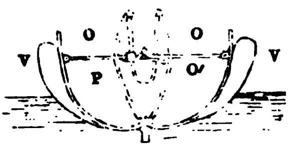


Fig. 4.



ven this number would be with lty contained in them, not to speak room required for water and pro- s. The number of passengers and on board of emigrant ships is fre- y double that above mentioned; ence, in cases of shipwreck, foun- , or other casualties incidental to yages, there is always a prospect se horrible struggles for preserva- mongst the unhappy sufferers which been before referred to.

boat in question is of French invention, but has been patented in this country as well as in France. It is constructed upon the principle of a skeleton frame, easily put together, and as easily disconnected and folded in a small compass. The skeleton is constructed so as to fold easily and commodiously into one-sixth of the space which it occupies when it is expanded and put to its proper use as a boat; and it is covered over with two folds of canvass of the best and strongest quality, which, after having been previously prepared with dissolved

caoutchouc, are glued one to the other, on the inner side of each, by a solution of the same material, so as to form an impenetrable and durable covering, wholly impervious to water, and more capable of resisting a sudden shock from breakers or sunken rocks, than either oak or the strongest deal planks would be. To provide for the permanent and unconquerable buoyancy of the safety-boat, it is provided with air-cells, or cases partitioned off, and each rendered independent of the other, so that in case of an accidental fissure being made in any one of these cells, the remainder, being uninjured, enable the boat to preserve its buoyancy.

The strength of the canvass can be increased at pleasure, according to the size of the boat, or the mode in which it is to be employed, so as to give this material a degree of strength equal to that of sheet iron; while its pliability adds greatly to the safety of the boat, by enabling it to sustain the shock of an accidental encounter with a rock or other hard body, by which an ordinary boat would be staved and swamped. The interior of the boat may, moreover, be strengthened to any degree required by the employment of thin sheets of iron or planks of wood, disposed so as to form a commodious bulwark and footing along the sides and bottom.

Having thus sketched, in a cursory manner, the advantages and facilities which at the first aspect of the invention are suggested to the mind, it may be advisable to examine what has actually been achieved by the employment of boats constructed upon this principle, of the materials indicated, in the kingdom of France; and as these facts are on record as having taken place under the immediate cognisance of the Minister of Commerce, the Duke of Orleans, and various other persons of the highest rank and of the first intelligence in France, they, perhaps, will serve in some degree as an apology for what might be said of the capacities of this patent boat. In the *Journal des Débâts* of April 21, 1841, we find the following description of one of these boats:—

"We have recently spoken of the new patent boats, which take to pieces, and are readily constructed, and which were lately *exhibited in minature* on the Seine.

"*A trial* of far greater importance was made, of their powers of conveying merchandise, in the presence of the Minister of Commerce yesterday, which was also witnessed by a vast number of spectators.

"The first large sized boat of this description reached Paris from Auxerre after a passage of unusual rapidity, and equal freedom from accidents of every description. Notwithstanding many severe concussions to which the boat was purposely subjected during the passage,—notwithstanding, also, the lack of water, which delayed the passage of other boats on the river; and many other drawbacks, as well studied as accidental,—not the slightest injury was sustained by the boat, which preserved its form, as well as the solidity of its frame, most perfectly; nor was there the smallest leakage to be perceived. When it is stated that the boat was of the following dimensions, it will at once be perceived that the principle upon which it is proposed to construct them has been subjected to the severest test which could be devised, and that it has endured it with success:—The length of the boat was 32 metres, 25 centimetres; the breadth was 5 metres, 10 centimetres. The cargo, brought from Auxerre, (in the centre of Burgundy,) consisted of 17 decasteres of new wood, weighing 89,862 kilos, (80 tons, 5 cwt.;) 4,000 metres of wood in planks, weighing 1,8000 kilos, (16 tons, 1 cwt.;) and several hogsheads of wine, weighing 2,138 kilos, (2 tons,) making altogether 110,000 kilos (98 tons, 6 cwt.) of cargo, which was safely delivered at the Quai d'Orsay. As soon as the cargo was discharged, the boat was taken to pieces, (which was effected in three or four minutes' time,) and being placed on two carts, the materials were conveyed to Auxerre, to be again put together, and floated down the stream with another cargo. This experiment, therefore, amply testifies to the strength and powers of resistance of the materials of which these boats are constructed; and as their facility of setting up and taking to pieces depends wholly upon their size, it will be found that five minutes, upon an average, will suffice to ship or unship a boat large enough to carry with ease and safety from twenty to forty persons."

In a mere preliminary sketch such as this, it is unnecessary to expatiate upon the numberless ways in which this invention may be turned to account. It offers to those who are fond of aquatic pleasures a safe and inexpensive means of pursuing their amusements: a folding boat, constructed upon the principle herein described, may be carried by one man to the water's edge, expanded and fitted out in a few minutes' time, and

d upon its native element with a equal to that of expanding an a. The various uses to which ention may be turned, need only ed at to render them obvious to est imagination. Pontoon boats, skiffs, wherries, punts, and all ous kinds of boats, whether used asure, commercial or warlike s, or in Polar voyages of dis- (where a portable and easily boat would be an invaluable aid) alike constructed upon the princi- l formed from the materials used boats.

neans of providing safety for his d passengers, however numerous y be, are here provided for every in command of a vessel; and she be a majestic ship of 120- or a mere chaloupe, the same are equally available; whilst the -room required for any number s will be greatly less than that re- for the boats now in use. Inde- ly, likewise, of this considera- hich in itself is of no mean weight, ier of almost equal importance, the the cost of each boat would unt to more than that of the fabrics use; and when to these two fea- added a third, of far higher im- e than all the rest put together, that the patent boat is incompa- uperior in point of safety to every nvention that has yet been laid the public,—it is conceived that ention has claims to the attention Government of this maritime which no other novelty in the way useful arts has ever yet possessed.

H.

scription of the Engravings.

From the Patentee's Specification.)

1 is a perspective view of an ex- party provided with one of the boats, ils of the construction of which are n figs. 2, 3 and 4.

2 is a longitudinal section; fig. 3 a id fig. 4 a cross section of the boat on.

s the keelson, C C C are ribs which from the keelson to which they red by the swivel joints H and I'. a gunnel, to which the ribs are made op, and which is jointed at I I, just the last rib at each end. G G G are es, which bind the ribs laterally to- being nailed, or otherwise secured to out half way between the keelson and gunnel. I J M are the stem and stern-pieces, which are secured to the keelson by nuts, M M, and connected to the nearest ribs by the links K L, K L, which links turn on joints at K K, and are attached by hooks and eyes to the ribs at L L. O O are girders, by which one half of the ribs (that is to say every other rib) is connected transversely at top; they are linked to the tops of the ribs by swivel joints, and are jointed at the middle, but to support them at the middle joints when extended, each rod has a short under-stay O', which is secured at one end to one-half of the rod, while the other is made fast by a ring P, which slides on the other half of the rod, and is just large enough to come over the under stay, when brought forward to the centre of the rod. R R are the rollocks for the oars. The parts before described constitute the framework of the boat or pontoon, and may either be of wood, or cane, or metal, or any other strong but light substance which will answer the purpose, excepting only that the joints, links, and rings, should, in every case, be of metal. When the framework of the boat has been thus put together, it is covered up to the edges of the gunnel with any of the approved sorts of waterproof canvas, or with thin sheets of metal, protected from oxydation (as far as may be) by suitable coatings, which covering is to be nailed, or otherwise secured to the gunnel. To the stem and stern and sides of the boat, floaters V V V, are also attached, consisting of hollow air and water-tight cases, made either of metal, or of some other impervious material, or consisting of cases filled with cork-shavings, or other substance of the like small specific gravity, or consisting of large pieces of solid cork; and these floaters, when consisting of cases filled in either of the modes aforesaid, are divided into compartments, two, three, four, or more, so that in the event of one compartment being damaged so as to let in air or water, the injury may not extend to the other compartments, and the boat still remain insubmergible. When the boat is not required for use, it can be folded up so as to carry on the shoulder, or under the arm, like an umbrella. For this purpose the nuts M M, which secure the stem and stern pieces to the keelson, are to be first unscrewed, and then the eyes L L, by which they are connected with the nearest ribs, unhooked, after which the links K L are to be turned in their joints K K, till they are in a line with the keelson; the stem and stern ends of the gunnel doubled down at the joints I I, till they are in the position indicated by the dotted lines J J, fig. 2; and the cutwaters J J brought round into the position indica-

ted by the letters M M in the same figure. The rings P P are then to be moved back, so as to set free the under-stays, O[1], which will allow the transverse girders O O, to yield at their middle joints. By then pressing the ribs G G G together, the whole apparatus will be brought into the folded-up position indicated by the dotted lines in fig. 4.

FOUR AND SIX-WHEELED ENGINES.

It is so very manifest a thing, that a carriage running on parallel rails must be safer with six wheels than with four, that one cannot help wondering that it should ever have been a subject of controversy among any considerable portion of a "thinking people," especially in an age so *mechanical* as that in which we live is said to be. It may serve however to diminish our wonder if we call to mind, that it is not long since it was debated just as seriously, whether such carriages could run at all—whether with six wheels or with four.

Indeed it would almost seem as if it were but of the order of things that mankind should never hit on any really useful discovery in art or science, without hatching at the same time (by way of set off to their merit?) some most extravagantly ridiculous whim or project. The same age which saw the lightning drawn at the will of man from the heavens, saw its learned circles divided into the knob and point factions, and royalty throwing its weight into the scale of error and absurdity. The same age which has seen the Atlantic bridged, as it were, by the steam power of England, has heard of our sinking hundreds of thousands of pounds to bore a hole under the Thames, that we may cross it on foot rather than steam it over head. And now that we have by great good luck found out that a steam carriage will run of itself on rails at the rate of from 20 to 40 miles an hour, without the help either of ground diggers, drag-chains, or cog-wheels—now that this happy discovery is producing such vast and beneficial changes on the face of society—behold our wise men and wiseacres engaged in a hot discussion, whether there is more safety in travelling at such prodigious velocities on four wheels or on six! Would that the folly of the thing were all! The four-wheel faction of our times is unfortunately a very powerful faction—powerful from the accidents of wealth, and place, and station—powerful from the bull-headed confidence which is ever natural to ignorance—a faction able to give practical effect on a fearfully large scale to its nonsensical preferences—and not very caring (apparently) how much society may suffer from them. It is a fact now established beyond all question, that the persistence by certain of the railway companies in the use of four-wheeled engines has been attended with a great sacrifice of human life. And it is also a fact, that, untaught by the past, and deaf to all remonstrance, they still persist in the use of the same sort of engines, at the imminent risk of illustrating, by many more homicides (*murders* would perhaps be the more appropriate term) the prodigious evil which stupidity in office is capable of inflicting on the community.

The four-feeted—we beg pardon, four-*wheeled* wrongheads—would not probably be so slow of comprehension, or so obstinate of purpose as they are, but for the self-elected champions, that is, the writers or scribblers of their party—men who, from their literary or scientific attainments, would be of no earthly use to the right side of any question, and for that very reason fasten with leech-like tenacity on the wrong side of this. Writing only for the gratification of their personal vanity, they seek nothing less than to elicit the truth; and belonging to a public body more remarkable, perhaps, than any other in this country for its exclusion of men of literature and science from its ranks, they find it a matter of but small difficulty to make "the worse" appear to those about them "the better reason." To be "a wit among lords" is proverbially easy; but not more so, we fancy, than to play the part of a seeming learned man among Railway Directors.

With what absurdities—what sillinesses—what fallacies—what misrepresentations—what downright false-*hoods* the cause of the four-wheel faction has been maintained (in the absence of all reason and common sense,)—it would take more time and space to relate than we can afford to so unprofitable a theme. We shall be the more readily excused for passing them over without more special mention when we state, that we have ourselves no intention whatever of joining in the fray. Our only purpose in now adverting to the subject, is to introduce and

commend to the notice of our readers an extract from the Report of the last monthly meeting of the Liverpool Polytechnic Society, which appears to us to comprehend in a few words the whole pith and marrow of the question at issue. A long paper had been read by a four-wheeler "On the comparative merits of four and six-wheeled locomotive engines" and it was thus well replied to on the instant by the chairman of the meeting, John Grantham, Esq., C. E.

"He would reply to Mr. ——'s arguments in the order in which they were introduced, but he must first explain a very common error into which the public are led while discussing the comparative merits of four and six-wheeled engines. Inside bearings and round fire-boxes are by many persons supposed to be alone applicable to the former, while outside bearings and square fire-boxes are supposed to be essential to the latter. He need not say how erroneous this opinion is, but till men divest their minds of this impression the subject must remain undecided—till this distinction is made all the lengthened papers in the *Railway Journals* stand for nothing. There was no reason why the square fire-box and the outside framing might not be applied to the four-wheeled engine, or the round fire-box and inside framing be adapted to the six-wheel engine. Such changes had been made, but were not general. For his part he was inclined to prefer the round fire-box and inside framing. The subject, however, for discussion at the meeting was simply as to the comparative merits of locomotives having four and six wheels. He had been engaged in the construction of several of each description, and had of course frequently travelled on them; and from his own observation he was led to the opinion that engines with four wheels were more unsteady than those with six wheels, and that this defect more than counteracted all the advantages to be derived from the saving in friction of the extra wheels. He thought the appearance alone, as exhibited by the drawings, even to an unpractised eye, would strengthen his arguments in favour of six wheels. Some serious accidents had happened to four-wheeled engines, that he believed would not from similar causes have occurred to six-wheeled engines. He did not allude to the collisions that had taken place on various occasions; all engines were alike endangered from those casualties, but he alluded to those cases in which no satisfactory reason could be assigned. The comparative cost of four and six-wheeled engines *of the ordinary construction* is, as Mr. —— stated, about 20 per cent in favour of the former; but this difference arises chiefly from the outside framing and the copper fire-box, and does not materially depend on the number of wheels. He would not say any thing as to the comparative cost of repairs, but would leave this subject to the directors of railways. He might, however, state it as his decided opinion, *that the first consideration for directors is, which plan will insure the greatest safety to those who unsuspectingly place themselves under their protection.*" Mr. Grantham concluded by expressing his conviction, that as a separate question, the principle of six wheels was superior to four.

DR. NORMANDY'S SOAP PROCESS.

"How are you off for soap?"
Popular Sayings.

Sir,—in a late Number of the *Mech. Mag.* (No. 975) I observed in the list of "Abstracts of Specifications of English Patents Recently Enrolled," a notice of the invention of "Alphonse René Le Mire De Normandy, Doctor of Medicine, for certain improvements in the manufacture of soap," which improvements appear to consist in a very liberal admixture of "the salts of potash and soda." I must confess I am not much of a chemist, and certainly never was a manufacturer of soap, but it does not, I fancy, require a great deal, either of chemical knowledge, or of manufacturing practice, to see that these alleged improvements are altogether fallacious. It is stated that "these substances are introduced into the soap (when the saponifying process is *complete*, and it is ready to be cleansed) either in the solid state, in pulverised masses, in the state of crystals, or in the state of crystals melted in their water of crystalization, or else dissolved in steam or water." But if the process of saponification is to be first complete, where is the good of the addition? Where the saving? I hate being uncharitable, particularly towards that class of *soi-disant* public benefactors yclept inventors; but really, Sir, it will require the explanations of some one whose lot has been cast in a much more fortunate die than mine, to disabuse me of the idea that this Doctor Normandy's invention consists of any thing more than a patent mode of selling cheap neutral salts for a price at least ten times more than they cost in their original state. I am strongly impressed with a notion that by the Doctor's admixture of them with soap, the public would be *defrauded* in two ways, viz: first, by paying ten times the proper value of these sulphates, which I conceive to be a useless addition; and,

secondly, by again paying for carbonate of soda (or common washing soda) the price of soap, when every washerwoman knows that that material may be had in retail for 1½*d.* or 2*d.* per lb.

My interest in the soap market goes no farther than my business demands, being,

A SHAVER.

P.S. The adulteration of common soda is practised to a monstrous extent. In a future communication I will explain an easy, cheap, and infallible mode by which the public may detect the fraud.

S.

April 21, 1842.

DESCRIPTION OF WHITE'S DISCONNECTING CRANK FOR PADDLE-WHEELS.

[COMMUNICATED BY THE INVENTOR.]

Fig. 3.

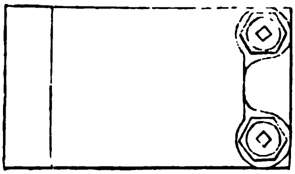


Fig. 4.

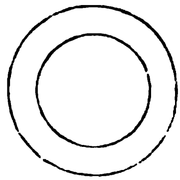
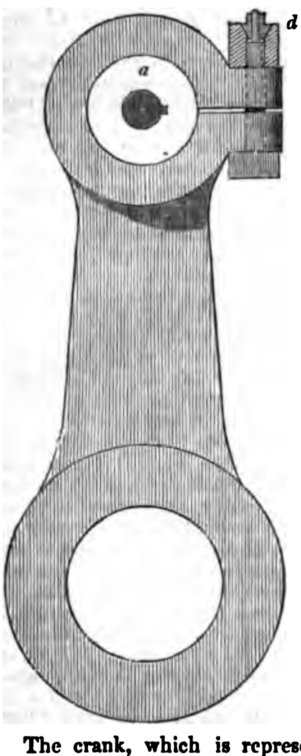
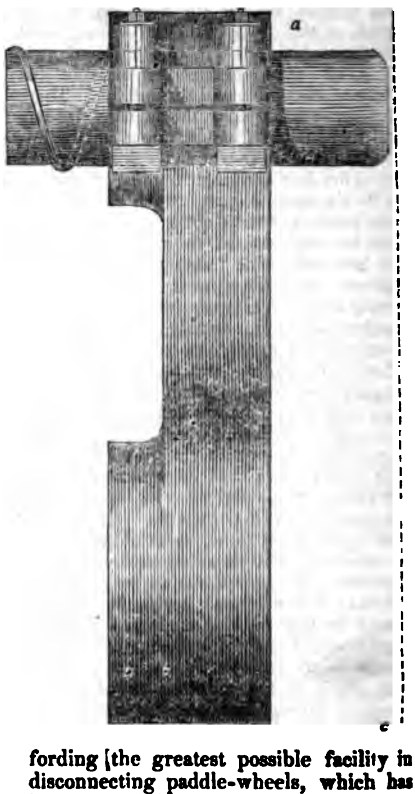


Fig. 1.



d Fig. 2. b



The crank, which is represented by the accompanying drawings, is intended *for marine engines*, with the view of affording [the greatest possible facility in disconnecting paddle-wheels, which has been found a matter of great importance

rigates, especially when on a pedition.

iciple is simple, and may be ipted to any marine engine ther expense than a new crank -pin to each paddle-wheel. advantage which some of the es in practice do not possess, previous preparation has been ne improvement.

e seen by fig. 2, that *a* is the and if we suppose the dotted be the face of the crank on shaft, the paddle-wheel, with situated, would be discon- the engine. The space shown e dotted line *b c*, and the end *a*, prevents the crank on the ft touching the brasses of the -rod when the crank is re- h the engine at rest, as would , were the vessel sailing with- d of steam; and when the onnected with the engine, the ed to is occupied by the ring, The end of the pin *a*, which ral upon it, fits a correspond- within the eye of the crank, mply turning the pin once hese spiral planes, the paddle- nnected, or disconnected, as it en. When the paddle-wheel disconnected by withdrawing to the position represented by fore the end of it can be re- the eye of the crank on the ft, it will be necessary to fix -wheel at that point, which eyes of the two cranks quite effect this several plans might ed, but perhaps none is better g a small portion of the outer he paddle-wheel toothed, and ith pinions of sufficient strength g and retaining the wheel to urpose.

the pin *a* is being moved, the nuts *d d* are sufficiently slack of its being turned round, by ge of a strong key, applied to the end of it, as shown in fig. en the paddle is connected with e, these bolts and nuts are p as tight as possible. To pre- large nuts *d d*, which fix the coming slack during the con- rking of the engine, there are ving a conical seat, which are e former, and these have a left hand thread; by this contrivance, any tendency the large nuts may have to slacken, would instantly be checked by the small nuts, and thus remove all danger of the pin getting loose after it has been properly fixed.

We are now to suppose the wheel connected, and the pin *a*, as firmly secured in the eye of the crank as bolts and nuts can make it. But then comes the question—is it as firm by the plan which has been described, as if the eye of the crank had been shrunk upon the pin in the ordinary way? No; neither is it requisite. By the latter mode there is no elasticity in the grip, nor any way to refix the pin properly in the event of its coming loose, which is a good reason for the excess of metal in the eye of a crank that is shrunk upon a cold pin. The plan I propose is different in principle. The pin is retained by an elastic grip from the construction of the crank; and if properly made in the first instance, while that elasticity remains, no strain the pin is exposed to will ever shake it loose, and if, by any other chance, it were to be so, the labour of a few minutes would suffice to refix it.

Fig. 3 is a view of the top of the crank, showing the double nuts, and the two projecting lugs through which the bolts pass.

For engines of great power, three bolts may be used to each crank, and if 2 inches in diameter, they would be found strong enough for the largest steam-vessel in Her Majesty's service.

James White.

11, East-place, Lambeth, and
Haddington, N. B.

THE PIANOFORTE—CONDITIONS OF EXCELLENCE—MERITS OF DIFFERENT INSTRUMENTS—IMPROVEMENTS SUGGESTED, &c.

Sir,—I feel an apology is due from me to yourself and the readers of your Magazine, for not having, ere this, contributed my promised communication on the action, &c., of the pianoforte, and I have only to plead in excuse the pressure of those daily avocations which, as all your readers engaged in business will not require to be informed, afford little leisure for any other pursuits.

The following conditions appear to be

indispensable to adapt this instrument to performers of ordinary abilities:—

Firstly, that the motion imparted by the finger to the key shall cause the hammer to strike the string with sufficient force almost instantly, and yet that the damper shall be removed from the strings before the hammer strikes them.

Secondly, that the hammer leave the strings instantly after the impact, for if it did not, it would act as a damper; and that it shall not be liable to return to the string before the blow is required to be repeated.

Thirdly, that the hammer can *easily* be made to repeat the blow with great rapidity.

Fourthly, that the damping apparatus shall be capable of stopping the vibrations of the strings quickly, and yet not resist the finger of the performer very sensibly.

Fifthly, that the moving parts shall not be much subjected to wear, and, its consequence, becoming noisy.

If the actions of pianofortes in general use be examined with relation to their capabilities of producing the above effects I fear I shall be justified in the opinion that there are none at present known which fulfil *all* the above conditions; in support of which opinion I will now proceed to describe the actions in common use.

The common square pianoforte action consists of a hopper attached to the key acting on a lever, technically termed the under hammer, which lifts the hammer that strikes the strings. As the hopper is constructed with an abutment below the level of its top, the lever, or under hammer, falls down upon that abutment after the hopper has "hopped off," and sustains the hammer a little below the level of the strings, which of course affords a complete facility for repeating the blow of the hammer without the key rising to its full height; indeed, the facility of repeating is so great, that after it has been some time in use, the hammer commonly repeats its blows when not required to do so. This evil has been obviated in more modern instruments, by the introduction of the check, such instruments being designated grand square pianofortes, and certainly they are a great improvement on the common square instruments; but, from the circumstance of the hopper, under hammer, and even the hammer itself working on leathern hinges, they wear rapidly. Perhaps the greatest improvement which the action of the square piano is susceptible of, would be to take away the under hammer, and make the hopper act directly on the hammer itself, or, in other words, to substitute the action of the grand piano for that of the square.

The action of the upright or cabinet piano is not very dissimilar to that of the square instrument, but the parts are necessarily disposed in a different manner to suit the altered position of the strings—the motion being communicated from the under hammer to the hammer, by means of a long wooden rod called a sticker, which is suspended from the hammer by a leathern hinge, the lower end being attached to the under hammer. This arrangement is much superior to that in the common square pianoforte, as the sticker and under hammer act as a steadying weight to the hammer, and tend greatly to prevent its returning to the string after striking it; but as the hinges have hitherto been constructed, they must wear more rapidly than bushed centres do. If the expense were not too great for the present rage for low-priced, miscalled cheap instruments, the hopper might be made to centre in the key, and the sticker attached to the butt of the hammer, by another wire centre, when its durability would be almost equal to that of a common grand action, and, having no check, it would continue to possess the advantage of repeating the blow with facility.

Upright pianofortes have been made with a jack, or lever action, and check—indeed, the first upright instruments constructed, (the upright grand pianofortes,) were so made; nor can I perceive any impossibility in making the lever or jack as high as the present hopper and sticker, so that it might act directly on the butt of the hammer, particularly in the very short instruments improperly termed picolo* pianos. Perhaps the increase of expense is the principal objection to such an action being generally used.

* The term "picolo" should, properly, be restricted to a peculiarly constructed pianoforte action, which was the invention of Mr. Wornum, but is often used to signify any very short upright instrument, even if made with the common cabinet pianoforte action.

mmon grand action is superior
:ity and durability to any other,
ng parts, excepting the keys,
made to work on wire axes or
and it appears capable of ful-
the required conditions, except-
of repeating its blow rapidly
'equiring the key to rise to its
it. The attempts to overcome
ave been pretty numerous, but
: is of opinion it has never been
but at the expense of greatly
complexity, and diminished
'. One of the earlier attempts,
aps the most successful one, is
Sebastian Errard, in which the
detached from the hammer by a
it motion of the key; but this is
by such complex machinery,
i to be expected the effects of
be to cause the motion of the
e accompanied by considerable
e practical difficulty is to check
er sufficiently high up, without
ing the contact of the hammer
check during its rising. The
is a contrivance by which he
overcome this difficulty, and if
l, he will send you, Mr. Editor,
nd description of the same. But
to the subject of durability. It
sly a most important condition
achine, that it consist of the
rts which are capable of effect-
urpose, and that it be so con-
as to be as durable as possible.
ther of these conditions usually
m complexity, which is a gene-
cter of the modern "patent,"
improvements in the action of
anofortes, particularly the at-
to revive "down striking"
y Kohlman and others, which
pear to have any advantages of
ch are not better obtained by
e sound board above the strings
construction of Mr. Wornum;
ravity resists, instead of favour-
eturn of the hammer, and the
ich does return it is felt to resist
as a spring damper does.
s no part of a piano wears more
han the mortises of the keys
eive the steady pins by which
retained in their places; and as
iderable looseness, resulting
ar, is accompanied by much
me contrivance which would either diminish wear, or readily compensate for it, would be desirable. I have been informed Messrs. Errard have hung the keys on bushed centres, and employed oval steady pins under the finger end of the keys; these being turned partly round, fill up the space produced by wear. Perhaps, if the mortises, particularly that at the end of the key which wears most, were lined with cloth, the action would not become so noisy as it usually does after being in use for a comparatively short period, to the great annoyance of those who resemble the writer in desiring to hear *tone* without noise.

If we may judge by the general absence of the means of quickly stopping the vibration of the long bass strings of grand pianofortes, we might infer there is some practical difficulty in effecting this. I think it will be found that rapid damping is best effected by increasing the surface of the damper. Any increase of its weight is very objectionable, as is also the employment of spring dampers, being felt so very sensibly to resist the finger; but if extension of surface should be found incapable of damping with sufficient rapidity, I would suggest the employment of two sets of dampers, one above and one below the strings, for the two lowest octaves of the compass, which I know from experience will effectually damp the most powerful vibrations of very heavy strings of the length of ten feet, which is fully four feet longer than the longest strings of a modern grand piano. In the case of short instruments there is no difficulty in damping, the great difficulty being to continue their vibrations.

On the proportionate lengths and sizes of the strings, depends, to a considerable degree, the obtainment of an equal quality of tone throughout the compass of the instrument; as does also even still more its standing well in tune; and should this meet the observation of pianoforte makers, I would, with all humility, beg to hint that it is a part of their business which many of them are too careless of, copying slavishly each other's scales, without first investigating the goodness of what they copy. But as it is ungracious to point out defects without suggesting remedies, I beg to offer for their adoption the following scale, which stands

well in tune, and affords a very equal quality of tone throughout, the bass being very firm and powerful.

C	$1\frac{1}{8}$	in.	No.	12	wire.
,,	$3\frac{3}{16}$	,,	,,	13	,,
,,	$6\frac{1}{8}$	,,	,,	14	,,
,,	12	,,	,,	16	,,
,,	23	,,	,,	18	,,
,,	45	,,	,,	21	,,
,,	88	,,	,,	25	,,

Your practical readers can easily discover for themselves the lengths for the intermediate notes, as also where to commence using covered strings in instruments of ordinary length, as from the length of the bass, the above scale requires a case full ten feet long.

It would appear as if a perfect scale were a matter of easy obtainment, for all the sounds in the octave can be produced by stopping the vibrations of one string at different lengths, and those lengths can easily be measured. If wire of uniform size and quality were employed, this would no doubt be the best method, but a pianoforte strung with wire of uniform size is very unequal in different parts of the compass. To avoid this greater evil we must choose the less one of using strings of different size, gradually increasing in thickness from the treble to the bass. As thick wire does not undergo so much manipulation as thin wire, its tenacity is usually less; hence one chief cause of the necessity of making the octave below less than double the length of the strings of a given note; at the same time it must not be *too* short; *no increase of thickness will compensate for want of sufficient tension*, which produces a bad tone. This is a very common defect in those notes of the piano which are immediately above the covered strings, and it renders what is termed the break in the tone very obvious.

The bracing of pianofortes is a very important consideration in their construction, although were mere capability of resistance the only consideration involved, it would not be difficult to design such an arrangement of its parts as would at once combine the least possible weight of material with the greatest strength; but this would require either that the bracing should be on both sides of the acting force, or that force on both *sides of the* bracing, as in Mr. John Isaac Hawkins's construction. Now, both these conditions are attended by some practical inconveniences; the former requiring so much space as to necessitate the employment of crooked keys, and the latter rendering it needful to have one of the attachments of the strings moveable, or a most inconvenient length of wire beyond the bridge, if the strings are attached to the other side of the bracing. Perhaps these evils might be avoided in upright instruments, by employing a straining force, equal to that of the strings applied at the back of the wrest plank, and to that part of the frame in front of which the strings are attached; both these parts of the instrument remaining fixed as at present, it would be needful to have a convenient means of determining the amount of the compensating force, as it might otherwise exceed or fall short of the force of tension.

In grand pianofortes it is usual to employ bracing beneath the sound board, and other bracing, technically termed *bars*, above the strings; consequently, the instruments so constructed fulfil the former condition, and are open to the same objection, viz., the necessity of using crooked keys. I think, however, when the circumstance of the different distances of the upper and lower bracings from the strings is considered, it will be obvious that the total strain is very unequally distributed on each set, for the upper bracings or bars are so much *nearer* the strings that they sustain from two-thirds to five-sixths of the whole force, which fact would suggest the desirableness of making the bars strong enough to bear the entire strain. As the bars are of iron, this might easily be done, and the inconvenience of the bracing beneath the strings, or rather a continuation of it, termed the arches, which connect the belly rail with the wrest plank be thereby avoided; for they are in the way of the hammers, and involve the consequent necessity of employing crooked keys, a disadvantage which is avoided in Mr. Wornum's construction before mentioned. Mr. Wornum's instrument has the further advantage of striking towards the sound board, though this is obtained at the expense of the bracing being as distant from the strings, and consequently from the straining force, as in cabinet pianofortes.

:arry out the above suggestion in cing of grand pianofortes, it would lful to attach the barrs very firmly string plate, and also to the wrest which may be best done by cover- : latter with an iron or brass plate icient thickness into which the ihould be inserted, and firmly down. The covering plate also to prevent the wrest pins from ; over, as it must be drilled to re- hem if made as wide as the wrest

I remain, yours respectfully,
ALFRED SAVAGE.
rlic-hill, March 22, 1842.

CTS OF SPECIFICATIONS OF ENGLISH ATENTS RECENTLY ENROLLED.

US SMITH, OF FEN-COURT, FEN- I-STREET, GENT., *for improvements inery for manufacturing cloths of d other fibrous substances* (commu- by a foreigner residing abroad).— ent Office, April 20, 1842.

mprovements described in this speci- have particular reference to the re- ntroduced manufacture of cloth by without weaving (though as much is ed by the patentee himself) and seem for their main object to obviate the n generally made to the felted cloths ing firmness of texture, by giving warp and woof the same as woven Mr. Smith's invention may be :d in brief as consisting in weaving or layers of carded wool into cloth, ordinarily the carded wool is first to thread, and then woven.

different sets of machinery are des-

vo carding machines (of the ordinary orking together at right angles : one ng the material to form the warp, in continuous layer, and the other sup- (by means of a grooved doffer) the to form the web or woof in succes- intermittent portions.

e warp and web so furnished by the machines passes into what is called iving machine," where the materials olidated, interlaced, and formed into like fabric.

om the receiving machine the cloth- ric is transferred to a hardening or g machine with a perforated steam- :, in which machine the material is further consolidated and interlaced is made fit to undergo the ordinary *of fulling or milling.*

th the ordinary fulling or milling machinery there is combined an overhauling machine, by which a large portion of the manual labour now required in the fulling or milling of cloth is said to be saved. By these combined machines the fabric is equalized, and stretched clear of folds and wrinkles, and made fit for finishing.

The claim is, 1. To the use of the two carding machines, so placed, and working together, that they furnish the material for the fabric with the fibres of each successive layer across the fibres beneath.

2. To the construction and use of the receiving machine.

3. The combining of the two carding machines with the receiving machine, so as to produce thereby collectively a set of machinery to form materials into cloth.

4. To the hardening or jiggering machine with the perforated steam chamber.

5. To the use of overhauling machines for stretching, flatting, and smoothing any kind or description of cloth, during the process of fulling or milling.

MARCUS DAVIS, OF NEW BOND-STREET, OPTICIAN, *for improvements in the means of ascertaining the distances vehicles travel.* Petty Bag Office, April 7, 1842.

Mr. Davis's improvements (in the ordinary odometers) consist in using a roller, which revolves by contact with the circumference of the wheel, and causing the counting part of the instrument to register the revolutions of the roller and not of the wheel; so that, as the revolutions of the roller are always the same in number for any distance gone over, whatever may be the diameter of the wheel the inconveniences arising from variations in the size of wheels are got rid of. The odometer, when thus improved, may, the patentee thinks, be more properly called a "Terrameter."

The claim is to the adaptation and application of a wheel or roller to the periphery of one of the running wheels of a carriage, or of a wheel or roller connected therewith, whereby the number of revolutions made by the wheel or roller can be ascertained, and consequently the distance travelled by the carriage.

The idea of employing such an intermediate wheel or roller is not new, but it has never before been carried into practical effect, for want of a convenient and durable method of affixing the roller, and connecting it with the registering wheelwork. Neither can we flatter the present patentee with having succeeded better than others in this respect. An apparatus such as he describes his "Terrameter" to be, would be in the "hospital" at least ten times as often as the wheels themselves, and that is oftener than would be consistent with the sound economy of any conveying or carrying establishment.

LIST OF DESIGNS REGISTERED BETWEEN MARCH 24TH, AND APRIL 27TH, 1842.

Date of Registration. 1842.	Number in the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Mar. 28	1156	Henderson and Co.	Carpet	1 years
"	1157	Patterson, Boyle and Co.	Joint for shortening the handles of parasols	3
30	1158	Henry Phillips	Button	3
"	1159	Thomas Ash	Compound disc of circular plates	3
31	1160	Thomas Marsh	Umbrella stand	3
"	1161	Ditto	Hat, coat, and umbrella stand	3
"	1162,3	Ditto	Fender	3
April 1	1164	Chadburn, Brothers	Syringe	3
"	1165	William Ford	Instrument for smoothing the exterior surface of drain tiles	1
4	1166	Joseph Baker	Pencil-case	3
"	1167	Charles Wheeler	Blind-roller	3
5	1168	Samuel Hill Smith	Knife	3
"	1169	Thomas Humphries	Carpet	1
"	1170,2	J. and T. Kipling	Ditto	1
"	1173	Henry Cope, Jun.	Lamp chimney	1
6	1174	Henry Brunton	Carpet	1
"	1175,7	Henry Cope, Jun.	Bottom of kettles, pots, &c.	3
7	1178	Joseph Morton	Fender	3
"	1179	John Hynam	Label	1
"	1180	S. Richards	Coffin furniture	3
"	1181,2	Henry J. Dixon	Carpet	1
"	1183	Henry Cope, Jun.	Bottom of kettles, pots, &c.	3
8	1184	John Sheldon	Portable letter and coin balance	3
"	1185	Joseph Schlesinger	Letter clip	
11	1186	William Blenkiron	Shirt (double breasted)	1
"	1187	R. Wilkins and M. Kendrick.	Lamp burner	3
"	1188	Ditto	Water valve	3
"	1189	Ditto	Detent for window blinds, &c.	3
"	1190	Charles Cash	Dust bin and sifter	3
"	1191	Charles Schlesinger	Music folio	3
12	1192	Frederick Long	Light extinguisher	3
"	1193	James B. Wilson	Block for hat linings	3
"	1194	B. Walton and Co.	Dish cover	3
"	1195	Ditto	Metallic handle	3
14	1196	Hutchinson, Higgins, & others	Centrifugal iron railway	3
15	1197	Robert Rettie	Machine for sweeping chimneys	3
"	1198	H. and J. Dixon	Carpet	1
18	1199	Richard Willis	Snuffers	3
"	1200	James Yates	Fender	3
"	1201	Frederick Barnett	Basting machine	3
"	1202	John Crowley	Iron lever or jack for looms	3
20	1203	John Davenport	Pocket comb sliding in case without cap	3
"	1204	Ditto	Ditto with cap	3
"	1205	Shoollbred and Co,	Dish cover	3
21	1206	H. and J. Dixon	Carpet	1
22	1207	Jno. Sheldon	Letter and coin balance and pencil-case	3
"	1208	Richard Kitchen	Skate	3
27	1209	Ridgway and Co.	Basin	1
"	1210	Ditto	Jug	1

[AGENTS FOR EFFECTING REGISTRATIONS, MESSRS. ROBERTSON AND CO., 166, FLEET-STREET.]

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 31ST OF MARCH, AND THE 28TH APRIL, 1842.

Joseph Clisild Daniell, of Tiverton Mills, near Bath, for improvements in making and preparing food for cattle. March 31; six months.

Julius Seybel, of Golden-square, Middlesex, chemist, for improvements in the manufacture of sulphate of soda and chlorine. March 31; six months.

William Liversidge Trippett, of Charlton-upon-Medlock, Lancaster, agent, for improvements in looms for weaving by hand, or by power. March 31; six months.

John Bevard, of Whitehead's Grove, Chelsea, gentleman, for an improved mode of expelling the air from certain cases or vessels used for the preservation of various articles of food. April 6; six months.

James Smith, of Deanston Works, Kilmadock, *Perth, cotton-spinner;* and James Buchanan, of the city of Glasgow, merchant, for certain improvements applicable to the preparing and spinning cotton wool, flax, hemp, and other fibrous substances. April 6; six months.

John Read, of Regent's Circus, mechanist; Henry Pirtland, of Hurst-green, Sussex, farmer; and Charles Woods, of Fore-street, Cripplegate, commercial traveller, for improvements in the construction and make of driving reins, harness, bridles, and reins, and in bridles and reins for riding. April 6; six months.

Jean George Sue Clarke, of Euston-grove, engineer, for improvements in supplying and regulating air to the furnaces of locomotive engines. (Being a communication.) April 6; six months.

Thomas Clive, of Birmingham, iron founder, for certain improvements in the construction of candlesticks. April 7; six months.

Tielens, of Fenchurch-street, mer- vements in machinery or apparatus Being a communication.) April 7;

., of Little Argyll-street, Regent's- in, for certain improvements in the d manufacture of boots, half-boots, d galoshes. (Being a communica- six months.

oner, of Clapham-common, gentle- rements in apparatus for attaching steners to gloves, and parts of gar- 3; six months.

Dawes, of Trafalgar-square, Charing- n, for a certain improved chemical compositions, to be employed in the glass, or other media of light. April

of Kidderminster, machinist, for in engines to be worked by steam, ours, which improvements are also umps for raising or forcing water, ids. April 15; six months.

ards, of Liverpool, bookbinder, for ements in the art of bookbinding, hinery, or apparatus to be employed 15; six months.

r, of Lloyds-street, Pentonville, gen- w method of preparing masts, spars, ., for ship building and other pur- 5; six months.

ia, of Leicester-square, chemist, for of manufacturing soap, candles, and April 15; six months.

lon, of Exeter, cabinet-maker, for ements in impressing and embossing k, cotton, and other woven or felted 21, six months.

l, of Jermyn-street, St. James's, boot ·, for certain improvements in the f boots and shoes. April 21; six

Troisbrioux, of Great Russell-street, entleman, for improvements in litho- ier printing-presses. Being a com- April 21; six months.

, of Gracechurch-street, doctor of ertain improvements in machinery or spinning cotton, wool, silk, and ibstances. (Being a communication.) nonths.

od, of Wilton, carpet manufacturer, le of weaving carpeting, and other April 26; six months.

ecking, of Birmingham, draftsman, rovements in the production of light of oil, tallow, and wax, and in the regulating and extinguishing the partly a communication.) April 26.

nd Joseph Jean, Comte de la Charité, egion d'honneur, of Leicester-square, n Claridge, of Weymouth-street, gen- Robert Hodgson of Salisbury-street, nan, for improvements in preparing brics to be used in covering roofs, er surfaces. (Being a communica- 6; six months.

ason Palmer, of Great George-street, civil engineer, for an improvement or in the construction of roofs and other ngs, and also for the application of tes or sheets of metal to certain pur- such sheets or plates have not here- ed. April 26; six months.

e, of Keppel-street, Russell-square, improvements in the making or con- owsers. (Being a communication.) months.

Pape, of Grosvenor-street, Bond- rte maker, for improvements in car- the construction of wheels. April 28;

William Losh, of Newcastle-on-Tyne, esquire, for improvements in the construction of wheels for carriages and locomotive engines intended to be employed on railways. April 28; six months.

John Varley, of Colne, Lancaster, engineer, and Edmondson Varley, of the same place, cotton manufacturer, for certain improvements in steam engines. April 28; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND BETWEEN 22ND OF MARCH, AND 22ND OF APRIL, 1842.

Moses Poole, of Lincoln's Inn, in the county of Middlesex, gentleman, for improvements in the manufacture of plaited fabrics. (Being a communication from abroad.) Sealed March 29.

James Hunt, of Whitehall, in the county of Middlesex, gentleman, for improvements in the manufacture of bricks. March 29.

James Hall, of Glasgow, upholsterer, for improvements in beds, mattrasses, and apparatus applicable to bedsteads, couches, and chairs. March 30.

John Harwood, Esq., of Great Portland Street, in the county of Middlesex, for an improved means of giving expansion to the chest. April 6.

James Andrew, of Manchester, in the county of Lancaster, manufacturer, for certain improvements in the method or process of preparing or dressing yarns or warps for weaving. April 6.

Edmund Morewood, Esq., of Winchester-buildings, Great Winchester-street, in the city of London, for an improved mode of preserving iron and other metals from oxydation or rust. (Being a communication from abroad.) April 7.

Henry Booth, Esq., of Liverpool, for improvements in the method of propelling vessels through water. April 13.

William Brockedon, of Queen-square, in the county of Middlesex, gentleman, for improvements in the manufacturing fibrous materials for the cores of stoppers to be coated with India rubber, and used for stopping bottles and other vessels. April 13.

Christopher Nickels, of the York-road, Lambeth, in the county, of Surrey, gentleman, for improvements in the manufacture of plaited fabrics. April 13.

James Smith, of Deanston-works, in the parish of Kilmadock and county of Perth, cotton-spinner, and James Buchanan, of the city of Glasgow, merchant, for improvements applicable to the preparing and spinning of cotton, wool, flax, hemp, and other fibrous substances. April 13.

Mathias Nicolas La Roche Barré, of St. Martin's-lane, in the county of Middlesex, manufacturer of cotton, for an improvement in the manufacture of a fabric applicable to sails and other purposes. April 19.

Reuben Partridge, of Cowper-street, Finsbury, in the county of Middlesex, engineer, for certain improvements in machinery or apparatus for splitting and shaping wood into splints, for the manufacture of matches and other similar forms. April 20.

Richard Dover Chatterton, of Derby, in the county of Derby, gentleman, for certain improvements in propelling. April 22.

Theophile Anton Wilhelm, Count de Hompesch, of Burich Castle, near Aix-la-Chapelle, in the kingdom of Prussia, for improvements in obtaining oils and other products from bituminous matters, and in purifying or rectifying oils obtained from such matters. April 22.

NOTES AND NOTICES.

Birkbeck Testimonial.—A Public Meeting was held at Freemasons' Hall on Monday last, LORD BROUGHAM in the Chair, when it was resolved, 1.

That "this meeting desire to record their deep sense of the eminent services which Dr. Birkbeck has rendered to the education of the people, by founding in 1800, and teaching a class for mechanics at Glasgow, by his munificent AID IN FOUNDING, and his constant care in superintending the London Mechanics' Institution, and by his ready assistance in forming similar bodies throughout the kingdom." And 2, That "the most fitting method of testifying the public gratitude to Dr. Birkbeck, is by founding in University College, London, a Professorship of Machinery and Manufactures, including the application of Chemistry and other branches of Natural Philosophy to the Arts, (the Professor to lecture in the country during the College Vacations), and that a subscription be commenced for this purpose." The second resolution was opposed by Mr. Hodgkin, Mr. Fogo, and some other gentlemen, who seemed to think that the endowing of a Professorship in a *College* inaccessible to *mechanics*, was not the most appropriate mode that could be imagined, of perpetuating the remembrance of Dr. Birkbeck's services to *Mechanics'* Institutions; but the promoters of the meeting had previously settled the matter otherwise, and so the resolution passed in the affirmative. The words in the first resolution, which we have marked in small capitals, will strike all who are acquainted with the actual history of Mechanics' Institutions, as remarkable. The time has been, when the Noble Lord who presided on this occasion, went a great way farther. May we flatter ourselves that his Lordship has discovered that well-merited honour to the dead, is not inconsistent with justice to the living?

American Stave-cutting Machine.—A machine has been lately invented that will dress at one operation, a rough board, or rived stave of any kind of wood, into a perfect stave for the cask, giving it on both sides the round of the cask, and jointing it to its proper level and taper, at the rate of one hundred per minute, and will do the work of 100 men. It is said to be very simple, not likely to get out of order, and can be built at small expense. There is one in operation at 103, Murray-street, New York. A patent was recently obtained in England, for the manufacture of staves, the preparation of which is said to be so simple, and so effectual, as to promise a revolution in this most important branch of cooperage. An American invention of this character, called the "Patent Rotary Stave-cutting Machine," and one possessing many advantages over that used in England, is now in successful operation in this country The superiority of that used in the United States, is demonstrated by the fact, that it is more simple in its construction, is managed with more facility, and throws off, in the same length of time, a larger amount of finished stock. The two machines operate alike in cuting leaves from solid blocks of wood, previously steamed for the purposes of softening and seasoning. In both, the waste steam of the engine is used for this purpose. In both, at the expense of but two or three horses power, the wood is cut like cheese, without offering any apparent resistance to the knife, and without the slightest waste in saw-dust, shavings, or chips. In the English patent, the leaves cut from the block are passed through *two machines*, to bring them to the required shape for the cask intended. In this operation, it most essentially varies from the American patent. This, at *one movement*, cuts out the stave in the curved shape, chamfers, crozes, and pares the ends; the last three processes mentioned requiring a separate labour of hands in the English manufacture of the stave. In the operation of the American patent, it is apparent there must be a great saving of time, labour, and expense. In the science of mechanics it is one of the most important improvements of the age, and must produce an entire revolution in the trade affected by the invention.—*Le Cras.*

Jefrey's Adhesive Composition, some remarkable experiments made with which at Woolwich, were noticed in our last (No. 976,) is now stated to consist simply of shell lac and caoutchouc dissolved in naphtha in certain proportions. The cost is about half that of common glue.

The Earl of Rosse's Gigantic Speculum, the casting of which was noticed in our last Number, is stated by Sir James South, in a letter to the *Times*, to weigh about 3 tons, to be 6 feet in diameter, 5½ inches thick at the edge, and 5 inches at the centre, and to present a reflecting surface of 4071 square inches, whilst that of the celebrated Herschel telescope had but 1811. It is to be fitted into a telescope of 50 feet focal length, but it is not expected to be cool enough for removal till after the lapse of a couple of months. The metals of which the speculum is composed, are copper and tin, 126 parts of the former to 57½ of the latter. The foundry where the casting was made is close to Birr Castle, the residence in Ireland of the Earl of Rosse, and, with the exception of the crucibles, which were made by Messrs. Dewer, of Old-street, St. Luke's, all the apparatus employed on this interesting occasion (the steam-engine itself included) was made in workshops adjoining the Castle, under the Earl's immediate directions, by workmen trained and instructed by himself.

New Egyptian Lighthouse.—Mehemet Ali, with the view of facilitating the commercial intercourse between his country and Europe, has caused a new lighthouse to be erected on Point Eunootos, near his palace at Alexandria. The tower is of stone, and 180 feet high; the lantern (supplied from England, by Messrs. Wilkins and Son) consists of 13 lamps, with parabolic reflectors. The light, which was first exhibited on the 1st inst., can be seen from a distance of 20 miles at sea. The structure was designed by, and has been executed under the superintendence of our countrymen, the Messrs. Galloway.

The Hindostan Steamer.—A magnificent steamer, of 1800 tons burden, to be called the Hindostan, has been built by Messrs. Wilson, of Liverpool, for the Oriental Steam Navigation Company, and is intended to ply between Suez and Calcutta direct, calling at Aden, and Point de Galle in the island of Ceylon. It is hoped that when the Hindostan gets fairly at work, the whole distance from England to Calcutta will be performed in 30 days; and if she equals the Oriental and Great Liverpool in swiftness and strength, the hope will be realized. Though larger than the Oriental, the Hindostan is on precisely the same plan; and another steamer, of the same size and construction, to be called the Bentinck, also intended for the line from Suez to Calcutta, is likewise in progress. It will be no small honour to Messrs. Wilson, and to the port of Liverpool, to have furnished the steamers for the longest line of steam communication in the world, and to have supplied vessels not to be surpassed by any port or any builder in Europe.—*Liverpool Times.*

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ROBERTS'S GALVANIC BLASTING APPARATUS.

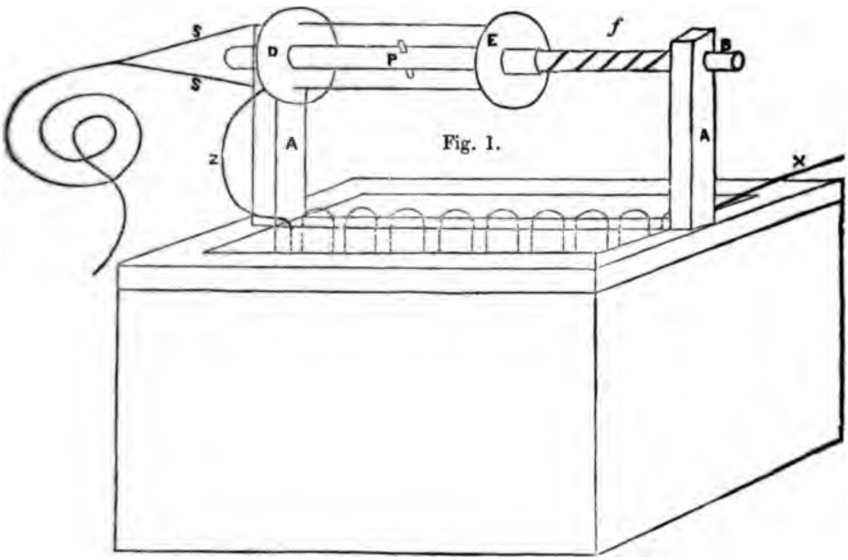

Fig. 1.

Fig. 4.

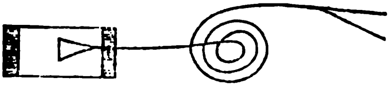

Fig. 3.

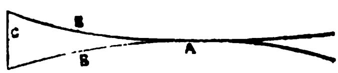

Fig. 5.

Fig. 6.

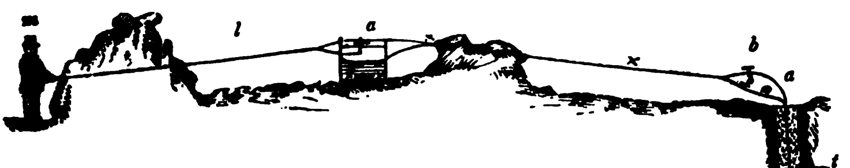

Fig. 2.

We mentioned briefly in a recent number, (Notes and Notices, No. 975,) a successful application, at Wester Craig's Quarry, near Glasgow, of a mode of blasting rocks by galvanism, invented by Martyn J. Roberts, Esq., F. R. S. E. The following very graphic description of the operation, from the pen of an eye-witness, has since appeared in the newspapers:—

"The workmen, under the direction of the superintendant of the quarry, had nearly completed their part of the operations before Mr. Roberts, (the inventor,) and Mr. Wilson, made their appearance, accompanied by assistants, with the battery and connecting wires for conveying the galvanic current to the charges of powder. These gentlemen carefully superintended the placing of the charges in the rock, and connecting the main coils of wire with the cartridges. When the arrangements were completed, and it was observed that the battery was placed on the top of the precipice over the quarry—whence the distance to the charges to be fired was shortest, and entirely free from danger—the spectators, by Mr. Roberts's advice, placed themselves on the summit of the precipice, and at the outside of the curved line of the rock, from which an excellent view could be obtained of the effects. The two charges at the foot of the rock were first to be fired; and having been uncertain where I should place myself, I was in the act of moving from east to west along the top of the precipice, when the signal was given while I was immediately behind and close to the battery, at the moment the two galvanic poles were brought together. The effect was instantaneous. The hill upon which I stood was shaken to its foundation, as by an earthquake, and the riven mass of rock went crashing down into the depths of the quarry. This was startling and beautiful, but fell far short of what took place upon the second application of the galvanic current to the two charges placed over each other in the face of the perpendicular cliff. A short time was required to remove the scaffold that had been used by the workmen in preparing the two upright blasts, and in placing the connecting wires, and applying screens in front of the charges to prevent the scattering of the splinters of stone when the explosion took place; these arrangements gave me sufficient time to gain an excellent position for observation. Every thing was at length completed, and every eye then was fixed, and the breath held in anxious *suspense; then* came the 'ready' from Mr. Wilson, who remained in the bed of the quarry; the assistant at the battery brought the discs in contact, and the whole face of the rock was riven asunder, from top to bottom, and from 300 to 400 tons of stone were torn from the hill, and came thundering down like an avalanche. It is impossible to imagine any thing more grand or interesting than this triumph of science as applied to practical utility, in rendering a hitherto most dangerous process perfectly safe and simple in execution."

Mr. Roberts has himself addressed a long and very able letter on the subject to the Highland and Agricultural Society of Scotland; and to this letter we are indebted for the following explanatory particulars, as well as for the accompanying engravings. Persons desirous of adopting, in their quarrying or engineering practice, Mr. Roberts's process, will do well, however, to consult the pamphlet itself,* which goes much more into detail than our limits will permit us to do.

The present, or what we may hope soon to call the *old* process of blasting rocks with gunpowder, is described with truth, by Mr. Roberts, as being at once troublesome, expensive, and dangerous. The quantity of powder fired on one occasion, at Craig Leith, near Edinburgh, amounted to no less than 500 lbs.; and loss of life or mutilation of limb, from premature explosions, is a matter of almost daily occurrence.

Mr. Roberts's improved process consists, firstly, in a new method of tamping; and, secondly, in using the electric fluid to fire the charge of gunpowder, in a safer, more effectual, and cheaper way than any heretofore attempted.

1. *Of the Tamping.*

The improvement in the method of *tamping* is based upon the curious fact—that if a tube of small diameter and moderate length be filled with dry sand, no force that can be applied at one end will press out the sand at the other. Instead of ramming down a quantity of gravel and broken stones into the bore-hole, (and this with considerable danger to the workmen,) Mr. Roberts finds it sufficient that dry sand is gently poured into the hole until a column of sand is formed of about 12 inches in depth; though if the

* Longman and Co., London; Grant and Son, Edinburgh.

ill admit of its being filled to a depth, so much the better. Mr. s believes that many hundred- s of gunpowder would be required out a column of sand 2 inches in er, and 18 or 20 inches in depth, in a solid rock. In all the expe- s he has made upon blasting rocks, ey are not few,) the sand has not one instance been blown out, pro- t was perfectly dry, and that its exceeded 15 inches when the dia- of the column was under 2 inches. nger of *tamping* by the ordinary l is thus avoided; for no rammers es are required, and much pecu- ss attending the old plan is saved.

the Electric or Galvanic Agency.

s long been known that gunpow- be fired by the electric fluid. In lier days of electric science it was lished by Franklin, who generated ity for the purpose by the common lectrical machine. At a later pe- n attempt was made to apply elec- thus produced to the firing of s in blasting rocks, but it failed; consequence of the high tension electricity, extraordinary precau- ere necessary to confine the fluid roper channel—namely, the con- g wire—perfect insulation of this ing necessary to prevent the elec- flying off to the surrounding earth. re, the American philosopher, see- inapplicability of this method of ng electricity, suggested the use of vanic battery for the purpose, but aratus was so cumbrous, at least adapted for every-day use by un- le workmen, that his plan was more than very partially adopted. two years ago, Mr. Roberts being ighbourhood where quarrying and are carried on to a great extent, ention was called to the subject by stressing accidents that daily oc- in the process of blasting, and he ontrived an apparatus for blasting vanism, which was found very ef- and was approved of by the ers of the Royal Geol. Soc. of all, before whom he read a paper subject, afterwards published in ansactions of that Society. But, e was some trouble connected with e of this apparatus, Mr. Roberts ards endeavoured to simplify its construction, that the benefits to be derived from it might be accessible to all; and after a great sacrifice of time, and the expenditure of a considerable sum of money, he had the satisfaction of perfecting it to such a degree, that any carpenter can now make it, and every workman use it with success. Experiments were made with it on blasting rocks and firing charges under water, in the presence of a deputation from the Highland Society, and these gentlemen, distinguished for their scientific attainments, expressed their unqualified approbation of the result. *After this*, Col. Pasley applied a galvanic apparatus to the firing of charges under water, but, from the want of a full description of Mr. Roberts's improved apparatus, and method of firing charges simultaneously, he did not meet with constant success.

Mr. Roberts makes use of a galvanic battery similar to that of Professor Daniell, (whose employment of sulphate of copper to excite the plates, instead of diluted sulphuric, nitric, or muriatic acid, he characterizes as "a discovery" of great importance, by which the progress of electrical science has been more facilitated than by any since the days of Sir Humphrey Davy;) but he substitutes for the earthen or glass jars a wooden box, divided into compartments by watertight divisions, as represented in fig. 1 of the engravings on our front page. To avoid the danger which would attend a close proximity to the apparatus on bringing the positive and negative poles into communication, (supposing the wires to be immersed in gunpowder,) Mr. Roberts has contrived an addition to the apparatus, whereby the poles are connected by pulling a string, which may be of any required length, so as to enable the operator to station himself out of the reach of all danger.

A wooden upright A, about 9 inches long and 2 inches square, is fastened to each end of the frame, and a round wooden cross bar, B, an inch in diameter, connects the tops of these uprights (fig. 1.) A disc of tin, D, about 3 or 4 inches in diameter, and having a hole an inch in diameter in its centre, is soldered to the wire attached to the zinc plate of the first pair (the negative pole): this disc is fastened to the upright at this end of the battery, the round cross-bar passing through the central hole. As the disc is in the

AA2

connexion with the zinc plate it may be called the *negative pole*, and if a wire attached to the positive pole is brought into contact with the disc the battery is put into action. Another tin disc E, of similar size to that of the negative pole, must slide freely along the round cross-bar: the central aperture in this disc should be about an inch and a half in diameter, and to it a tin pipe, of the same diameter and about 2 inches in length, is fixed, (this is to be on one side only of the disc and must project towards the positive pole of the battery.) The use of the pipe is to keep the moveable disc steady during its motion along the bar: it must not project on both sides of the moveable disc, because it is necessary that the surfaces of the discs be in perfect contact with each other when the battery is in action.

Suppose then, a wire connected with the positive pole to be fastened to the moveable disc, and this disc to be then moved along the cross-bar until it comes in contact with the fixed disc, the battery is in action, because there is a metallic communication from one pole to the other. To enable an operator standing at a distance from the battery to bring these discs into contact, a string S, is fastened to the moveable disc and reeved through two holes bored in the fixed disc, and the two ends tied together about a foot behind the fixed disc, so as to form a span or double cord proceeding from the moveable disc. To this double cord is tied a string of any convenient length, which Mr. Roberts calls the *lanyard;* the end of this lanyard is carried to some place where the operator may be in safety, and on pulling it, the moveable disc slides along the cross-bar into close contact with the fixed disc, and the battery is thus put into action.

A further contrivance must however be provided to prevent the discs touching each other before the lanyard is pulled, and this Mr. R. effects by fastening to the pipe of the sliding disc a spiral wire, F, (such as a bell spring), which encircles the cross-bar, and has one end fixed to the wooden upright on the positive side of the battery. The length of the spring when unextended is such, that the moveable disc attached to it stands about 7 inches from the fixed disc, but when the lanyard is pulled, the spring extends, and the discs come in contact with each other, and if the lanyard be slackened, the spring separates the two discs, the action of the battery is stopped, and there is then no danger in approaching the charge of gunpowder, should it not have exploded when the electricity circulated through the fine wire.

To prevent the possibility of the discs touching each other before the workmen are prepared for the explosion, a wooden pin *p*, is placed between them; this is inserted into a hole bored through the cross-bar about midway between the discs. When all is prepared for firing the charge, this pin, which Mr. Roberts calls the *safety pin*, is removed from the hole before the lanyard is pulled.

We come now to the method of connecting the long-conducting wire with the battery.

In the practice of blasting, the conducting wire should be of copper, and about one-eighth of an inch in diameter; its length must of course vary according to circumstances; but, in general, if the battery be placed 20 or 30 yards from the rock to be blown up, it will be in perfect safety.

If the battery is to be 30 yards from the explosion, 60 yards of stout copper wire covered with cotton thread well waxed will be required. The 60 yards of wire are cut in half, and the two lengths of 30 yards each laid side by side, and bound together with twine nearly in the same manner as each wire is covered with cotton. As an additional security, this double wire may be done over with sealing-wax varnish. About a foot in length of the ends of these wires is left free, that is, not bound together in the manner the rest of their length has been. (See fig. 2.)

We have now a kind of rope 30 yards long, consisting of two wires bound together, and the four ends projecting. Take one end of this rope, and fasten its two projecting ends to the galvanic battery in the following manner: Solder one projecting end to the sliding tin disc, and the other projecting end (of the same extremity of the rope) to the wire attached to the positive pole of the battery. The wire rope must be *permanently* fixed in this manner; in fact, it thus forms a part of the battery. When not extended for use, it may be coiled up, or wound upon a reel. Let us now suppose the wire rope extended, two of its projecting ends fixed

ttery, and let the other ends be l by a few inches of fine wire; so suppose the plates immersed citing liquid: if the *lanyard* be he *sliding disc* will move for- contact with the *fixed disc* or pole, the electricity circulates positive pole through one part nducting wire, then through the (fusing it) back through the t of the conducting wire to the isc, and from this to the fixed ch is the negative pole of the

re immersed in the gunpowder is of steel, and very *fine*, (of the l by watch-makers, *balance wire*) he degree of heat raised in me- ectricity is in proportion to the ss of their diameter. A reel of teel wire containing six or eight sts 3*d*., and will perhaps serve ndred explosions. A very short it is employed at one time, be- obstruction to the progress of through a conductor is in pro- o its length, and, if the fine oo long, it will prevent the pas- ectricity in sufficient quantity to

s it would be inconvenient to every explosion the trouble of a fine wire to the ends of the ig wire, Mr. Roberts has con- *cartridge*, a number of which kept ready for use, and one without loss of time to the *con- wire* whenever required. The is a tin tube filled with gun- and in this are placed the ends out copper wires connected by a wire; the copper wires are each feet long, and serve to convey ricity from the *conducting wire* ttery to the fine wire immersed wder of the cartridge. These ires he calls *communicating* The tube is stopped at both ends covered with cement to keep owder dry; when thus corked nted the cartridge may be fired ater without a risk of failure. mmunicating *wires* must be of length to extend from the bot- e bore-hole in the rock to a few e the surface, and as the holes m more than 6 or 8 feet deep, ay be taken as the average length mmunicating wires.

The details of making the cartridges are as follow:—

"Take 20 feet of stout copper wire covered with cotton thread, double it, and twist the two parts at the looped end closely together for about 6 inches of their length, A, fig. 3; then, with a file or cutting pliers, cut off the round end of the loop, and the ends will project as *horns* of half an inch in length B B; then bare the extreme points of these *horns* (being about half an inch asunder) of the cotton thread that is around them, and clean them with a file: now take half an inch of the fine steel wire, lay it across from horn to horn of the stout wire, and there (C) let it be firmly soldered. We have now two long stout copper wires connected at one extremity by a fine steel wire: the end of these wires are twisted together to prevent the horns slipping into contact with each other, and also to preserve the fine wire from being broken by any pull or jerk given to one of the communicating wires. As this combination of wires is placed in the bore-hole, it will be exposed to the action of the ignited charge of gunpowder, and, without some precaution to secure it, would be destroyed by every explosion: to prevent this waste, the communicating wire is first covered with cord (in the same manner as the conducting wire of the battery is covered), and an additional covering is then given of hard whip-cord or of fine binding-wire, (binding-wire will perhaps be found best, as it effectually prevents the included *communicating wires* being injured by the broken fragments of the rock). The fine wire soldered to the ends of the communicating wire will be destroyed at each discharge, for the electricity will fuse it, but this fine wire is easily replaced at a cost of three-halfpence for every dozen cartridges.

"The body of the cartridge is a tin tube, 3 inches long, and ¾ of an inch or an inch in diameter, of which the joint is soldered and rendered perfectly water-tight: the fine wire across the horns of the twisted wire is placed in the centre of the tube, and retained firmly in this position by a cork at the end of the tube, through which the twisted wires pass, fig. 4. The best way of fixing the twisted wires is to split a bit of cork half through, lay them in the slit, then force the cork into the tube, and this will jam the wires firmly in the slit: taking care that the horns do not touch the sides of the cartridge, and that the cork is covered with a good cement, as this assists in preserving the horns in their proper position. The cement I generally use is composed of one part of bees'-wax and two of resin, which, if put on hot, readily sets, is very strong, and does not crack in cooling;

but any cement that has these properties, and effectually keeps out damp, will answer the purpose. Having now the tin tube with the fine wire firmly fixed in the centre, the next operation is to fill the cartridge with gunpowder. It must be fine sporting powder and *thoroughly dry*; unless this be attended to, the fine wire may be fused by the electric fluid without igniting the charge, for the action is so rapid, that if the powder be damp, it will hardly be dried, much less ignited by the fusion of the wire. The best method of ensuring this dryness, when a great number of cartridges are made at one time, is to dry the powder over a steam-tight box filled with boiling water; but, when a few dozen only of cartridges are required, heat a soup plate by a fire, and when it is a little hotter than the hand can bear, take the plate from the fire, and throw into the plate a sufficient quantity of powder to fill two or three cartridges; shake it in the hot plate for two or three minutes, and then fill the cartridge tubes with the powder, which will now be perfectly dry and warm:—*while in this state* cork the ends of the cartridges, and cover the corks with the same kind of cement as that used for the corks through which the wire passes."

It only remains now to detail the actual process of blasting with the apparatus before described.

When a rock is to be rent by the explosive force of gunpowder, the first thing done is to bore in the rock a hole, of a depth and diameter proportioned to the strength of the stone and the quantity we wish detached. Let us, for example, suppose the hole to be 6 feet deep and 2 inches in diameter: cleanse it from dust and moisture by passing a straw or oakum wad several times through it, then lightly pour into the hole half the intended charge of gunpowder; put a cartridge upon this, and upon the cartridge pour the remainder of the charge; do not ram the powder down, for the lighter it lies together the better: the cartridge will thus be in the centre of the charge, and its long *communicating wires* will project 3 or 4 feet above the surface of the rock: the charge of powder and cartridge will fill about 8 or 10 inches of the hole.

The next operation is tamping. Thrust a straw or oakum wad gently down the bore-hole until it is about 2½ feet from the surface; this done, there remains an empty space (that is to say, containing merely atmospheric air,) of about 2½ feet in depth between the wad and the gunpowder. In practice Mr. Roberts has found it of great importance to allow this distance to exist between the powder and the wad, for the expansion of the air by the flame of the ignited powder adds to the rending force, and there is also an effect produced similar to that when a ball is rammed but half-way down a musket barrel. When the wad is in its proper place fill the hole up to the surface of the rock with dry sand. The hole is now charged, and about 4 feet of the cartridge communicating wires project above the surface of the rock.

Having filled the box of the battery with a saturated solution of sulphate of copper mixed with a little sulphuric acid, place it at some convenient distance from the rock, behind a large stone, or in any situation where it is not likely to receive injury from the falling fragments of the rock; put the frame of plates on the ground by the side of the box, and be careful the safety pin *p*, is in the hole prepared for it; then unroll the conducting wire, and attach the ends that are free to the cartridge communicating wires projecting above the surface of the rock. This attachment may be done by twisting them together, but it will be better that a binding-screw, fig. 5, be soldered to each free end of the *conducting wire*, and to these the *communicating wires* are readily attached by inserting an end into each screw, two or three turns of which will make the contact perfect. Fig. 5, represents the screw; *b*, hole for insertion of the communicating wire; *c*, the conducting wire soldered to the binding-screw, and *d*, the screw. This contrivance will be found of great service, because the cartridge can be attached to the conducting wire without loss of time, a good metallic contact between them is ensured, and, if the binding-screws are covered with cotton, varnish, or some other insulating substance, there will be no metallic contact between the separate parts of the conducting wire; and this should be avoided, because it would open a channel to divert the electric fluid from its proper course.

When the cartridge has been fastened to the conducting wire of the battery, unroll the lanyard, and carry the end to a situation where the operator can stand in perfect safety. Every one must now retire from the rock, except one person, whose office will be to ascertain that the

in is in its place, and that the not touch each other; he is then the box in such a position, that shall be towards the point from the lanyard is pulled, taking care d the double cord are clear; he its the frame of plates into the pair of plates into each cell, careful the fixed disc is towards ce where he stands to pull the : the safety-pin must now be ut, and the operator retires to the here the lanyard has already been e then pulls the lanyard slowly adily, without a jerking motion; veable disc slides into contact with ed disc, the electricity circulates, charge of powder is exploded. shows all the apparatus in proper or firing.

is figure *a a* are the communica- res of cartridge.

artridge.

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Binding screw.

Conducting wire.

anyard.

Man to pull the lanyard.

attery.

acant space.

amping stuff.

operator must after the explosion to the battery, and remove the rom the cells, coil up the lanyard, the conducting wire from the cart- mmunicating wires, and coil it up. mmunicating wires, most probably, found jammed between the frag- of the rock, and there they must until released by carrying away es, when the wires will be found ed:—if they are forcibly pulled m the fragments of rock, they broken: the tin tube and fine the cartridge will be destroyed force of the explosion, but the nicating wires will serve for an- artridge. It sometimes happens the battery has not been used for ays, the papers that are round the come so dry, that time is required exciting solution to penetrate them to the zinc, and if an at- be made to work the battery be- paper is well saturated with the it is probable no electricity will e: to avoid such a disappoint- either *dip the frame of* plates into a tub of water, for the space of five or ten minutes, or allow the plates to remain for a few minutes in the battery cells before the lanyard is pulled.

Mr. Roberts gives, also, a description of a method by which several charges may be fired simultaneously, which is stated to have been found of great service at Skerry Vore Lighthouse, now erecting under the superintendance of Mr. Allan Stevenson; but for this, as for many other illustrative details, we must once more refer to the pamphlet itself, which does altogether great credit to the scientific sagacity and practical skill of its author.

ADULTERATION OF ZINC.

Sir,—I beg to direct public notice, through your pages, to an important fraud in the market of metals, which I have recently discovered. Having had occasion for a considerable quantity of zinc, in as great a state of purity as I could readily obtain it, for the purposes of my patented method of preventing the corrosion of iron, I purchased and employed a quantity of waste clippings of sheet or patent zinc, obtained from a zinc-worker's establishment, and stated to consist principally of the best Belgian zinc. Circumstances occurred, during its use, to make me suspect this zinc contained some foreign metal; and on submitting to analysis several different specimens of the sheet zinc, just as received, I found them *all* to consist of variable mixtures of *lead and zinc*. The alloy of lead in some amounted to nearly one-fourth the amount of the zinc; in one specimen, to one-third; and in the greater number to between a sixth and a fifth of the weight of zinc. My curiosity having been excited, I have since examined several other specimens of sheet zinc, and find most of them alloyed with lead. This adulteration is obviously of the most mischievous tendency, as regards the chief purposes to which sheet zinc is applied, promoting its oxidation, and increasing its weight as a covering.

The end in view in the adulteration is, however, abundantly plain. Zinc is now about 49*l.* per ton, in sheets; lead is only 19*l.* per ton: hence, a metal consisting of three parts zinc, and one part lead—crude zinc being 37*l.* per ton—will

only cost 32*l.* 10*s.* per ton, and can be sold at 49*l.* per ton, so that there is a clear profit upon the adulteration of 5*l.* per ton; added to which, the base metal is *denser* than zinc, and hence *more weight* must be sold to cover the same surface.

The adulterated zinc might be at once recognized, by an experienced hand, by its superior flexibility to that which is pure.

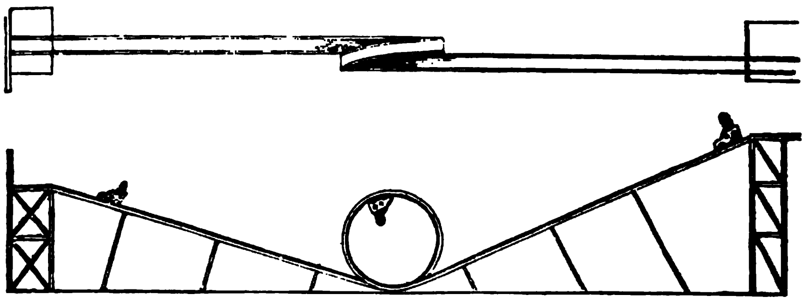
As such frauds are of public importance, and deserve exposure and reprehension, I have deemed this notice not unsuited to your journal, and am, Sir,

Your obedient servant,

ROBERT MALLET.

Dublin, April 24, 1842.

CENTRIFUGAL RAILWAY.



[From the *Liverpool Courier*, April 20.]

"Those who have visited the exhibition held some time since at the Mechanics' Institution, will probably recollect a small model railway in the room appropriated to illustrations of hydrostatics, in which a tiny iron carriage was made to run down an inclined plane, traverse an iron circle, and ascend an inclined plane on the opposite side. The curiosity attracted much attention, and those who did not fully comprehend the principle of its operation were not a little puzzled at the wonderful precision with which the little vehicle performed its rapid journey. If the miniature railway was deemed wonderful, we know not what the public will now think of that exhibiting at the theatre. We had the pleasure of viewing it in its full operation on Friday last. A carriage, sufficiently large to hold a man or a woman, is loaded with heavy weights, and despatched down a plane which reaches from the upper portion of the gallery down to the orchestra; here, by its own impulse, it traverses a vertical circle of 40 feet diameter, and the remaining force is expended in carrying it forward up another slope, which reaches to the back of the stage. The journey having been performed with fifty-six pound weights, a bucket of water, &c., without either of the weights or a drop of liquid having been displaced; a young man, and subsequently a young lady, entered the car, and each performed the apparently perilous journey in perfect safety, and without the slightest inconvenience. The exhibition is exceedingly curious, and well worthy the attention of the public."

The invention noticed in the preceding extract, is the same, we believe, which our readers will find included in our List of Registered Designs for the last month, No. 1196, April 14, Messrs. Hutchinson, Higgins and others, proprietors. The principle of the thing is well known, though the application of it to enabling people to travel with their heels uppermost is, doubtless, new. The prefixed engravings are copies on a reduced scale of those deposited at the Registration Office.

ord,—With the utmost respect I ddress to you a few words on the of the meeting held in the Free- Hall, on the 25th April, to con- subject of a testimonial to the of the late Dr. Birkbeck.

ord, when one looks back at the onths during which the Com- boured, (and laboured earnestly, h good intention, no doubt,) to a scheme by which the memory te revered President of the Lon- hanics' Institution might be pre- o his country, one cannot but feel nd angry at the worthlessness and ness of the result, and still more countenance and support which ceived from your Lordship.

is this result?—"Resolved, that *st fitting* method of testifying *lic* gratitude to Dr. Birkbeck is ding in *University College, Lon-* professorship of machinery and tures, &c.!"

ord, the Committee of Lincoln's ds have, in this, and as far as they ne, succeeded, most decidedly, in he first stone in the bad work of alive the name and fame of the d individual in question.

s take a full view of the new of- rsonage thus about to be created rofessor of "machinery and ma- es." Let us look him full in the ile we inquire into his preten- Firstly, what is he to teach? , how is he to teach? and, whom is he to teach? On the nt, it appears that the professor each the elements of machinery, application of these to the parti- achines, the construction and n of which he will exhibit and his class;" secondly, he is to lecture; and, thirdly, he is to to a class at the London Univer- d so the memory of the good kbeck is preserved! Further, nmittee inform us that by this they are carrying out the spirit ntentions of the worthy deceased, the instruction of the working My Lord, practical men well know hinery and manufactures are not rned in the lecture-room, but only the medium of a long and close iceship in the workshop. The lecturer himself must go to the mechanic's workshop, and pick up, how he can, that knowledge which he is to give out to his class. My Lord, no greater mistake has ever found its way abroad than this meddling twaddle of teaching the working classes their own trades. In the course of your speech, my Lord, you gave the working classes a noble character for their unrivalled skill in their several trades, as well as for the gentle and uncomplaining spirit with which they bear the privations to which their station in society peculiarly subjects them. My Lord, you there did them justice. The artisans of England stand at the head of the world, as regards excellence in their several departments; and whether we view them in the various divisions of labour, of skill, of science, of continued industry, and indomitable perseverance, we must at least pronounce them so far perfect, as not to need the poor hour of the lecturer's prattle about "machinery and manufactures." But, my Lord, suppose this lecturer of "machinery and manufactures" had in his possession some secret which it would be worth the artisan's knowing—I say, suppose this to be the case, he being located in the London University—I ask, in the name of any thing sensible, how the artisan could avail himself of the good held out to him? The idea of artisans, working from six in the morning until eight o'clock at night, going to listen to a lecture by a "professor of machinery and manufactures," at the London University, is indeed the most unique piece of absurdity which could by possibility flit across the brain. As far, then, as the tendency of this Professor is to carry out the *spirit of the intentions of the late Dr. Birkbeck*, it must be perceived that those distinguished noblemen and gentlemen who have so handsomely come forward on this occasion have fallen into a very singular delusion.

My Lord, there are some mysterious allusions, not exactly understandable, printed in the circular issued by the Committee, to which I would draw your attention. In the third paragraph is the following:—"that while we were unable to devise means of affording direct advantage to the subscribers whom we hope to find in all parts of the kingdom,

so it was our duty to *avoid any application to merely local purposes of the proceeds of so general a contribution.*" I would ask, my Lord, is not the application of the funds to the creation of a professorship of machinery and manufactures, at *University College*, an application to *local purposes?* In the fourth paragraph is another singular allusion:—"It would have been highly satisfactory to us, if we could have suggested some means whereby the fund which we hope to raise should be devoted immediately to the instruction of those classes of the people, whose intellectual and moral improvement Dr. Birkbeck has laboured to promote." Thus it ever is, my Lord—the old saying is here again verified—"the weakest goes to the wall," and is crushed; nothing could be *suggested* to serve or assist *them;* while, in the midst of this helplessness to "suggest" for the working classes, a lucky "suggestion" carried the day in favour of the students of University College!

Enough of this professorship: as a fitting testimonial to the memory of a man, who has deserved so well as Dr. Birbeck, the thing is an absurdity. What, my Lord, would have been said, if at the time of the death of the great Nelson, an individual had sprung up, and proposed to perpetuate his memory by the establishment of a professorship in one of the universities of Oxford or Cambridge, for the purpose of teaching the art of *yarn spinning?* Doubtless, my Lord, the man, would have been looked on as mad, and his scheme would have been at once scouted. The place his countrymen gave him was among her great and worthy names, which had been preserved to memory in the noblest form; and there, in his *marble* cabin, he still lives; while, before his shrine, the races of his countrymen, through all their generations, pass "lovingly and reverently," and then the Nile, and Trafalgar, and other recollections of his great services are recalled to memory, and thus from generation to generation is transmitted and secured the great Admiral's fame. So, my Lord, should be transmitted to future times the memory of those good services performed to his country, by Dr. Birkbeck. A statue erected to his memory in our Metropolitan Cathedral, would be the most appropriate, the most national, at the same time the most graceful and durable memento of his name; and further, the world would thus be informed, that among the virtues there enshrined, a new virtue, hitherto not much heeded, had been recognized in the person of him, the friend and teacher of the English artizan.

One more point, my Lord, yet remains to be noticed, and that is the contemptuous and disparaging tone with which Mr. Hodgkin's hint at a monument was received. A "bit of marble," forsooth, was the only term you could use on this occasion. My Lord, when a great name, when a great man chooses to be eccentric, then a whole host of inferior minds follow in his wake with wonderful unanimity. So it was with some of the movement spirits at the meeting. Lord John Russell talked of the "bit of marble," Mr. Roebuck, also talked of the "bit of marble." My Lord, when men of refined minds, in any age of the world, spoke of the art of the sculptor, it has never been in this poor and unworthy tone. The sculptors of antiquity were not accustomed to such language. It was not the custom for cultivated minds in the times of Canova, Flaxman, Chantry, and their brethren in genius to talk of the "bit of marble," when alluding to their productions. No; their "divine art," and their "immortal productions" were somewhat nearer the style in which their genius was spoken of, while the loftiest and best intellects have, in all ages, yielded reverential admiration to the genius of sculpture. The "bit of marble" sounded doubly odious coming from you, my Lord; it almost impresses one with the conviction that some great minds are denied the enjoyment of, and appreciation of, the beautiful. How different was the tone of another great man, Napoleon, when standing among the monuments of Egypt, he exclaimed to those by whom he was surrounded, "Forty centuries are now looking down upon us." My Lord, the "bit of marble" has brought down to us the deeds of antiquity. The "bit of marble" has perpetuated the manners of the far-off race of old Egypt. The "bit of marble" has recorded the graces of humanity of ancient Greece. The "bit of marble" has brought down to us the splendour and the heroism of ancient Rome, and the "bit

" yet remains, in the opinion ıest and best of mankind, the hy medium for the commemo- irtue.

, " bit of marble" then, my ·ould preserve the memory of eck. That spirit of benignant would be far more worthily ›priately lodged in our Metro- .thedral, than in the low rooms ›ndon University. His place among the great men of his nd not in the cabined and crib- itory of a professor of " Ma- ıd Manufactures." The fame od Doctor Birkbeck would be ›ecured by the "bit of marble." of marble," my Lord, would he heart of posterity, with far ıt and effect than the husky the professor, and the divine sculptor would give an immor- s fame, as far transcending the 'er of the "professor," as the exceeds that of the moon, or :d intellect that of the meanest

ı, my Lord, your Lordship's ›le servant,

HENRY BROWN.

IAMS'S FURNACE.—INTRODUC- TION AT GLASGOW.

n the *Glasgow Constitutional.*)

must be admitted that in a manu- ty such as Glasgow, where hun- eam engines are daily at work, that of a very dense character, ›ked upon hitherto as inseparable rosecution of manufactures; yet progress of science, that we ought ›atisfied with our atmosphere of le there remains the slightest obtaining the means of entirely · of abating the evil. Numerous been proposed for the purpose of ›r dissipating the smoke emitted rnaces of steam engines, but, at city, none of them have so far s to produce any general diminu- nuisance. ·Of late, public atten- n recalled to the subject by the ' Mr. Alston, of Rosemount, who ble in his pursuit of any object nceives to be calculated to pro- : or individual benefit. In the s inquiries and researches on the ved methods of removing the ance. *Mr. Alston* became con- vinced that the plan of Mr. C. Williams, which had been to a considerable extent adopted in Manchester, was the best yet projected, and calculated to effect the object he had in view, almost to perfection. He accordingly used every means to circulate a knowledge of the merits of Mr. Williams's invention, and pressed, with an anxiety highly honourable to him as a public benefactor, on his friends who had steam engines, to try the experiment of adopting Mr. Williams's method. In this he has succeeded; and several proprietors have agreed to apply it to their furnaces. The first experiment was made on the engine furnace of Mr. Alexander Harvie, at Govanhaugh Printfield and Dyeworks. The furnace having been tried for a few days with complete success, Mr. Alston made a respectful application to the Dean of Guild, and the other members of the Dean of Guild Court, to visit the premises of Mr. Harvie, and judge for themselves of the invention and its results. This was handsomely assented to, and on Thursday last, James Black, Esq., the sub-Dean, and the other members present, accompanied Mr. Alston to Govanhaugh, where the whole apparatus and its effects were exhibited and explained.

Exteriorly, the furnace exhibits no difference from those of the ordinary form. It is in the interior of the structure chiefly where the means of preventing the formation of the smoke are accomplished. [Here follows a description of the furnace, with which the readers of the Mechanics' Magazine are already familiar.]

When the Dean of Guild and the other gentlemen arrived at the works, Mr. Harvie directed fuel to be put upon the fire, and, excluding the air from the air chamber, he showed the usual quantity of smoke issuing from the stalk. By an ingenious application of glazed apertures at each end of the boiler the state of the flues could be distinctly seen, while immediately over the door of the orifice leading to the diffusion box, another glazed aperture affords a view of the cast-iron plate, and the effects of the first contact of the air with the smoke from the furnace. While the smoke continued to pour in volumes from the stalk, Mr. Harvie opened the door or valve of the air-ports, and in about a minute—in fact as soon as the smoke at that moment in the flues and stalks could escape—not a particle of *visible* smoke was emitted! During the time the door was shut the flues were seen filled with smoke; but immediately on its being opened and air admitted the flues were filled with flame. These alternate shuttings and openings were several times repeated *with the same* and the result was invariably the same.

the air chamber door shut there was the ordinary smoke emitted, with the door open there was none whatever!

The Sub-Dean and the other members of the Dean of Guild Court expressed the highest satisfaction at the results, and declared their perfect conviction of the invention being completely successful in accomplishing the intended object.

We understand that, now when a certainty exists that at a trifling cost the smoke nuisance may be completely removed, the Procurator Fiscal of the Dean of Guild Court is determined to bring several of the manufacturers, &c. having engines in the city, before that Court, under the act of Parliament, to decide the point whether such parties can be forced to obviate the smoke of their furnaces in the most effectual way.

CAPTAIN CARPENTER'S PROPELLERS APPLIED TO CANAL NAVIGATION.

We noticed in a recent Number the performance of Captain Carpenter's stern propellers, and of the disc engine, as fitted to the pinnace of the steam-frigate "Geyser," when tried on the river. We learn that, subsequently to these trials, experiments have been made with this boat on the Grand Junction Canal, in the presence of Sir F. Head, and other leading Directors of the Canal Company, and some partners of the eminent carrying firm of Messrs. Pickford and Co.

Notwithstanding the unfitness of Captain Carpenter's boat for canal navigation, arising from her great breadth of beam, the results obtained during these experiments were such as to induce the gentlemen present to express their unanimous opinion, that the important problem of the adaptation of steam power to canal navigation had at length been completely solved.

We are, further, much pleased to learn that the Committee of the Grand Junction Canal Company have voted a sum of 100*l.*, to be tendered to Captain Carpenter, on behalf of the Company, to mark the sense which they entertain of the important service which he has rendered to the canal interest by his invention.

We may now, therefore, hope soon to see steam-power as triumphant on our canals as *our rivers; for* the objection of injury to the banks from the action of paddle-wheels being once removed, (by the adoption of stern propellers,) the rest is easy. The proprietors of the disc engine are making active exertions to take the lead in this new field of enterprize, and, from all we can learn, with good prospects of success.

PILBROW'S CONDENSING CYLINDER ENGINE.

Sir,—I have been prevented sooner offering my thanks to your valuable correspondent "S," for his good wishes, and for his communication upon my engine (in No. 971) which I have read with satisfaction; because, though he does not take quite so favourable a view of it as I could wish, yet it appears free from prejudice, and his facts, as there given, are but proofs of the correctness of my own views. The drawing he mentions, I presume he perceived was meant merely to illustrate the *principle*, not to *work* from; therefore it was made as compact and as neat as the circumstances permitted, and occasion required.

I feel also obliged to your correspondent "Throttle-valve" for his "suggestions" (in No. 972,) though I think he misapprehends the grand object which I endeavour to obtain by my invention, and incline to think he cannot have seen the pamphlet written upon it, as an arrangement is there made for "passing the centre with *one* engine."

I am, Sir,

Very respectfully yours,

JAMES PILBROW.

Tottenham Green, April 18, 1842.

PATENT LAW CASES.

Vice-Chancellor of England's Court, Lincoln's Inn.

April 21, 1842.

Hancock v. *Hullmandell.*

[In January, 1838, Mr. Charles Hancock, the eminent animal painter, obtained a patent for "certain improved means of producing figured surfaces sunk and in relief, and of printing therefrom, and also of moulding, stamping, and embossing." The defendant, Mr. Hullmandell, also obtained a patent in November, 1841, for "a new effect of light and shadow, imitating a brush or stump drawing, or both combined, produced on paper, being an impression from a plate or stone prepared in a particular manner for that purpose, as also the mode of preparing the said plate or stone for that object." Mr. Hullmandell's "new effect"

Mr. Hancock to be obtained
ich are included in his specifi-
the present was a motion for an
restrain the alleged infringe-

rt and *Mr. Elderton* were for
Mr. Girdlestone and *Mr. Rotch*
dant.
of his specification on which the
es, is the following: "I take
tion of caoutchouc mixed with
and, or any other composition
resist the action of acids, and
the whole surface of the plate,
ith an etching point, or other
trument, remove all the parts
not intended to be in relief, (or
ne or any suitable composition,
it upon plain, curved, or undu-
lic surfaces, the whole of that
design which I intend to be in
when the drawing is perfectly
it in a dish or trough of ade-
sions, with its face downwards,
a proper and uniform depth in
quor, which I allow to operate
ired effect is obtained. Should
uire to be placed in higher relief,
ock, or cylinder, is to be washed
spirits of turpentine, and a
on in the manner usually prac-
aying of grounds; it is then to
d again to the action of the acid,
lowered with the graver."
e of similarity between the pre-
ess and that followed by the de-
ll be seen by reference to the
vol. xxxiv. p. 207, where a very
is given of his specification.
s affidavits from artists and men
were produced on both sides;
as a great conflict of testimony
novelty of the inventions, and
e was an infringement of the

onclusion of the arguments of
and *Mr. Elderton* on behalf of

Chancellor said, when the Court
ns of such scientific knowledge
atters giving the opinions they
quite unwilling to take upon
say what they had stated was
which he should do to a certain
granting the injunction in the
te of things. Therefore, in the
rily dark state of the case as it
esented to the Court, he thought
course would be to do nothing on
but to let it stand over for the
bring such action as he should
to try the validity of his patent.
llestone, with Mr. Rotch, however, insisted that upon the conduct of the parties since the granting of the patent of Hullmandell, as well as the ground that two legal titles were brought before the Court, one of which must be taken, *prima facie*, to be as good as the other upon a motion for an injunction, the application ought to be dismissed altogether. The learned counsel also went into a lengthened argument upon the principles of the two patents, in the course of which illustrations were given by the execution of impressions of the engravings in open court, his Honour observing, that in the whole course of his experience he never remembered such a peculiar kind of "drawing in equity." (A laugh.)

The *Vice Chancellor*, in giving judgment, said he considered the case a very important one, and for that reason he should follow the course he had already suggested. He wished to have it made absolutely certain whether there had been an infringement of the patent or not. If he were to act on the present impression in his mind, it might happen that when the case came before a jury, a verdict might be pronounced against that opinion, and then he should have on a matter of fact, and not being at all conversant with the subject, an opinion he had pronounced on the verity of the case contradicted by persons who were, by the law of the country, the constituted judges of disputed matters of fact. He therefore adhered to the opinion he had expressed, that all he could do was to let the motion stand over for the plaintiff to bring an action, or otherwise to take such proceedings as he might be advised, with liberty to either party to apply.

April 26.

Russel v. *Ledsam.*

[For the better understanding of this case, we prefix a few explanatory particulars. Mr. Russel, the plaintiff, is the well known gas tube manufacturer of Wednesbury, who, besides being himself the inventor of a method of making tubes, for which he had a patent long since expired, is assignee of a patent for improvements in this branch of manufacture, granted to Cornelius Whitehouse in 1825, and renewed on its expiration, for a term of seven years. Mr. Ledsam, the defendant, has been recently manufacturing tubes under the patent of Mr. Richard Prosser, of which we gave an account in vol. xxxiii. p. 386, and it is the validity of this patent which is the present subject of dispute. Mr. Russel alleges it to be an infringement of Whitehouse's. In our account of Mr. Prosser's invention we referred to a patent still older than either Prosser's or Whitehouse's, namely, that

granted to Henry Osborne in 1817. Osborne used a pair of grooved rollers, similar to the rollers employed in rolling round iron. The invention of Osborne has been employed chiefly in welding gun-barrels from plates of iron called skelps, and is now in common use by the gun-makers of Birmingham. About 1820 Osborne commenced the manufacture of gas tubes by means of his invention, and the tubes so made were used for lighting his workshops. He also made gas tubes for Mr. Clegg, the earliest, and still the most eminent of our practical gas engineers. The tubes were made in lengths of about 4 feet each, and had to be passed between the rollers many times before they were completely rounded. The welding was done on a mandril, and the latter rollings without a mandril, for the purpose of rounding the tube by repeated rollings as is done in rolling round bar iron. In 1824 Mr. Russel took out his patent for welding tubes, and proposed the use of a tilt hammer, and also grooved rollers; he says the welding may be done either with or without a mandril. In 1825 Whitehouse took out his patent for the same purpose, which (as before stated) was afterwards assigned to Mr. Russel. The invention of Whitehouse consists in drawing the tube at a welding heat through a pair of dies or holes, the dies or holes gradually decreasing in size, and the pipe or tube being re-heated after each drawing operation; only one half of the tube is heated at a time, and after that half has been reduced to the required diameter, and drawn to the requisite length, the other half of the tube is heated, and drawn through a pair of dies; it is then re-heated and drawn through another pair of dies, a little smaller; after which it is once more re-heated and re-drawn through another pair of dies a little smaller than the preceding; the tube, after six operations (three at each end) is finished so far as concerns the welding, and a skelp of 5 feet 6 inches long becomes by these operations 8 feet long. The main bench moves at the rate of 1 foot per second, so that to weld a pipe 10 feet long would occupy at least forty seconds of time. Now the peculiarity of Mr. Prosser's invention consists in this, that a pipe is perfectly welded by one operation of the machine, and whatever may be the diameter of the pipe, a length of 10 feet is welded in *two seconds*.

The judgment of his Honour, the Vice Chancellor of England, will be found to state very clearly the difference between the two inventions, and the decided improvement which the defendant has effected.]

The *Vice Chancellor*. With regard to the merits of this case, in the first place it appears to me to be an extremely interesting case, and interesting from this circumstance particularly, because it seems to me to be quite established that the thing which in substance Mr. Whitehouse claimed as the principle of his invention was new; namely, the causing to pass by some means or other the imperfectly formed iron tube, when it was nearly in a state of fusion, through a cylindrical ring which would give such a pressure on the softened metal as would cause the parts to weld, and in that sense to form a perfect tube. I observe, however, there are differences brought forward with respect to the mode which the defendants adopt. The plaintiff himself was utterly indifferent to the mode by means of which the almost fluid metal should be caused to pass through the cylindrical ring —through what he calls in one place, swages, or dies, and in another place, dies or holes. He was utterly indifferent to the mode by which that propulsion should be created.

Now, as I understand it, the defendants have invented this plan. By means of four pulleys, which are grooved, or things in the shape of pulleys which are grooved, the defendants contrive to give a propulsive motion to the heated tube as it passes through the grooves, which grooves collectively make together a ring or cylindrical ring, which has the effect of compressing the tube in every part, and causing the operation of welding, but which at the same time has the effect of by itself causing the tube to move forward, and therefore gets rid altogether of that machinery of the draw-bench and the pincers and so on, which is described at considerable length in Mr. Whitehouse's specification.

You see the substantial difference between the two things is, that according to the specification of Mr. Whitehouse, the die or the hole is fixed, it is motionless, and it is motionless in this sense, that it not merely stands still, but it *communicates* no motion; whereas, as I understand it, the pulleys which are used by the defendants, though they themselves are fixed in this sense, namely, that their centres do not move, yet their circumferences are moving, and the motion of their circumferences in a fixed plane, they being at right angles to each other, has the effect of giving a motion to the tube as it passes through their edges. Now that, certainly, is a very important difference between the two, although I am not going now to pronounce on the question whether the thing is identically the same. It seems to me, however, that there is a very substantial difference in that respect between the two.

Well then, it is observed that the plaintiff's patent, that is to say, Mr. White-

patent, has in its specification this
, that after the tube has been moved
tain extent, the pincers are to be
', the thing itself is to be reversed
on, and that which before was not
to the action of the fire, is to be
the furnace, and nearly fused, and
go through the same operation as its
had previously gone through.
it is very remarkable that in this
tion of Mr. Whitehouse, it is said,
in praise of the thing, "That the
f the pieces of tube thus made, is
a great advantage, as by these
hey may be made from 2 to 8 feet
one piece, whereas by the old modes
ths of tubes cannot exceed 4 feet
considerable difficulty, and conse-
an increased expense," whereas it is
ly plain, upon the statement of the
ry used by the defendants, that so
stinting the tubes to the length of
or 8 feet, they may be made to any
which the tube may be propelled,
e is no limit to it, as I understand.
ere was, and I have no doubt that
is specification says is true, there
ery great advantage derived by the
iven by Mr. Whitehouse's patent of
the tubes even to the limited extent,
t seems to have been considered the
extent of 8 feet.
Richards (for the plaintiff.) They
nake them so long as we can.
Bethell (for the defendant.) Oh yes
and longer.
Vice Chancellor. That I do not
y thing about.
Bethell. Will you give us an order
12 feet long?
Vice Chancellor. I am speaking of
g only theoretically. There is no
limit to the extent to which the
y be made by the defendants' pro-
one uniform operation. Well, now,
ings do appear to me to be things
ht very much to be considered, when
tion is raised whether there has been
ngement of the plaintiff's patent or
d though I can easily understand
en the thing was in a ruder state at
when Cowley's case came forward,*
it might very well do then to hold
s an infringement of the patent, yet
t but myself think there is a fair
here to send to a jury. I cannot
nk, on the whole, there is quite
to constitute a fitness for sending
to a jury. And one thing which
d to me was this, that if it be true
re is a very great improvement by
of the machinery under which the
defendants are acting, why, if I were to grant an injunction in the first instance, I might be depriving the public for a time of the benefit of that very improvement. Now I should be extremely unwilling to do that, unless I felt the case was irresistibly clear, and therefore I rather think the safest and the best course, and therefore the course I ought to pursue, is to direct there shall be an action brought by the plaintiff, in such manner as he may be advised, against the defendant, for the purpose of determining this question; and I shall direct it in the usual terms, that both parties may be at liberty to apply. If it were desired by the plaintiff that he should have an inspection of the defendants' works, I do not understand the defendants themselves to refuse it.

Mr. Bethell. We have been always ready and willing.

The *Vice Chancellor*. I think so, and therefore it struck me it might be possible for the plaintiff to get in without an order. The witnesses of the plaintiff should have an opportunity of stating to the jury what is the actual state of the defendant's machinery, in order that their testimony may be contrasted with that which may be given on behalf of the defendants, and in order also that they may be enabled to state what is the difference, if any, between the machinery as now constituted, and the machinery as it was in the month of July or August last. What I incline to do is this, to give a direction that the defendants shall, at reasonable times, permit an inspection of their machinery by agents of the plaintiff, the plaintiff giving reasonable notice; and I would give liberty to apply, meaning thereby, of course, that if it became necessary, after an inspection, to require the defendants to make an affidavit, then I would direct the defendants should make an affidavit, rather than direct them in the first instance to make it, because it appears to me I must presume, and I have a right to presume the defendants will act fairly.

Mr. Richards. That is amply sufficient.

The *Vice Chancellor*. The order is, that the motion at present stands over; the plaintiff undertaking to bring such action as he may be advised, and the defendants being directed to permit the plaintiff's agents, at reasonable times, and with reasonable notice, to have an inspection of the defendant's machinery, with liberty to apply. It appears to me that that will be the order necessary for the real and fair trial of this great question.

Mr. Rotch. A like inspection, of course, by the defendants, of the plaintiff's machinery.

Mr. Richards. Certainly.

The *Vice Chancellor*. Of course.

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ssel v. Cowley, 1. Cr. M. and R. 864.

NOTES AND NOTICES.

Photo-lithography.—An artist at Rome, named Rondoni, has just succeeded in taking photographic drawings on stone, and printing from it. In that way he printed a lithograph of a nebula of Orion! This is printing at second hand from nature herself: bringing the firmament within one move of the press. The next process will be to print speech and music warm from the lips.—*Spectator.*—The most curious part of the whole affair our esteemed contemporary has omitted to state. The reflected image of the nebula of Orion exhibited the exact likeness of a whale! "Very like a whale!"

The Precursor—the name given to the first of a line of large steam-vessels about to be established between Calcutta and Suez—which arrived recently in the River, from the Clyde, accomplished the voyage in the remarkably short space of 70 hours, being at the average rate of 11½ geographical miles per hour. She is of 1,751 tons, and 500 horses power. The engines, which are of the common side lever construction, have been constructed by Mr. Robert Napier, of Glasgow.

Steam Navigation of the Danube and Black Sea.—In 1830, a company for the promotion of steam navigation on these waters was chartered by the Emperor of Austria. In 1831, the first boat, the "Francis I.," was launched. In 1840, they had 10 river boats and 10 sea boats in operation, and 5 more on the stocks. These boats now make regular passages, during the navigation season, between Lintz, Vienna, Pest, Semlin, Galatz, Varna, Constantinople, Trebizond, Salonica, and Smyrna. The passage from Vienna to Constantinople is accomplished in 17 days. All the boats are built after English models. Two of them, the "Sophia" and "Stephan," are of iron. The fuel used is coal, from the vicinity of Pilsen, in Bohemia.

The Maine and Danube Canal, which now approaches its completion, is 108 miles in length, and connects the Danube, near Ratisbon, with the Maine, at Bamberg. When it is opened, an uninterrupted communication by water will exist between the North Sea, or German Ocean, and the Black Sea—one of the most magnificent lines of internal communication in the world.

New Quicksilver Mines.—A correspondent writes from Florence, that the mine of quicksilver discovered last year in the environs of Peravezza, near Pisa, is in full work, and during the last month yielded more than 6,000 lbs.—a produce that is daily increasing. The Grand Duke had visited them, and expressed his satisfaction at the able manner in which they had been conducted, announcing the intended appointment of a commission of French, English, Italian, and German geologists and chemists, to search for the other mines of quicksilver, which, according to tradition, exist in the Grand Duchy.—*Morning Chronicle.*

Cornish Steam-engines.—The number of pumping-engines reported for March last is forty-eight. They have consumed 4,163 tons of coal, and lifted 34,000,000 tons of water 10 fathoms high. The average duty of the whole is, therefore, 56,000,000 lbs. lifted one foot high by the consumption of a bushel of coal.

Duration of Malleable Iron Rails.—Time was when engineers generally were under the impression that rolled iron edge rails, of 50lbs. to the yard, would last from 40 to 60 years, but experience is fast dissipating all such notions, by demonstrating that the duration of rails of malleable iron is not determined by mere superficial wear, but by the time which it requires for a given amount of trade rolling upon them, to disintegrate them internally—that is, to produce disruption and exfoliation of the laminæ of which they are composed. Mr. Ellwood Morris, an American engineer, calculates (*Franklin Journal* for March) that 1,500,000 tons gross weight, conveyed over rolled iron edge rails of the T and H forms, weighing from 33 to 42lbs. per yard, will destroy them in 10 years. The rails of the Philadelphia and C[illegible]umbia railroad, which are of this description, have bee[n] 7 years, and are already exhibiting s[ymp]toms of coming destruction. Mr. Mo[rris has the] candour, at the same time, to menti[on that these] results are in perfect accordance wit[h what his] countryman, Mr. W. Chapman, of Ne[w ... (see] *Wood on Railroads*,) predicted, many [years ago, as] most likely to happen.

The "Mountains High" of Marine [Wa]ters.—Some writers have asserted tha[t the height] of the waves of the ocean, from the [trough to the] crest, reaches often to 40 and 50 fee[t. Dr.] Arnott, in his Elements of Physics, [says] "no wave rises more than 10 feet abo[ve the ordi]nary sea level, which, with the 10 feet [its sur]face afterwards descends below this, [gives 20] feet for the whole height, from the b[ottom of the] water valley to the adjoining summit. [From ob]servations subsequently made with g[reat care in] the midst of the Pacific Ocean, by the [Ex]ploratory Expedition, it appears that [Dr. Arnott] was very nearly right. The maximu[m height of the] waves was then found to be 22 feet.

Dutch Wagons.—The Rev. W. L. [...] paper on the Agriculture of the Neth[erlands, read] before the Royal Agricultural Society [...] describes the Dutch wagons as light[...] with a very narrow track to accommo[date] the narrow roads on the tops of the dyke[s ...] would be a great incumbrance in the a[...] round within a very narrow space, a [...] stitute has been adopted, viz., a very s[...] pole, which rises in front, and is m[oved by the] driver with his foot, as he wishes to [...] course of the wagon to the one [side or the] other: a person unaccustomed to the [...] contrivance, would never be able to dr[ive the] wagon, which requires great judgmen[t ...] while a drunken driver would be disco[vered ...] way off by the oscillations of his wago[n ...] quently runs off the dyke, and is ove[r...] the ditch on one side or the other, the [...] ing no power to keep it straight when [the] pole has not a steady foot to guide the f[...] The Dutchmen always make their horse[s ...] wagon when not heavily loaded; by [...] time is saved in haymaking and harv[est ...] horses being accustomed to it, natura[lly ...] carriage-horses, when the load and roa[d ...]

Fall of a Meteoric Stone at Grune[berg, in Si]lesia.—On the 22nd of March, 1841, at [...] inhabitants of Heinrichau, who were a[...] fields, heard three heavy reports like t[...] in the air, and soon after a whizzing [...] ended in a sound like that of a heavy [...] to the ground. The sky at the time [...] wholly clear. Some persons went in t[...] from which the sound came, and, after [...] about one hundred and fifty paces, fo[und a] hole in the earth, at the bottom of w[hich, about] half a foot below the surface, they foun[d a stone] which had just fallen. The stone, (whi[ch has the] form of a four-sided pyramid,) is evid[ently a frag]ment of a larger one which burst in th[e air ...] of its sides are broken, the fourth is cov[ered with a] thin black crust peculiar to meteorites. [It weighs] two pounds four ounces.—*Poggendorff's* [...]

The Steam-bark "Clarion," fitted wit[h ...] propellers, was totally wrecked on t[...] March, on the island of Cuba.

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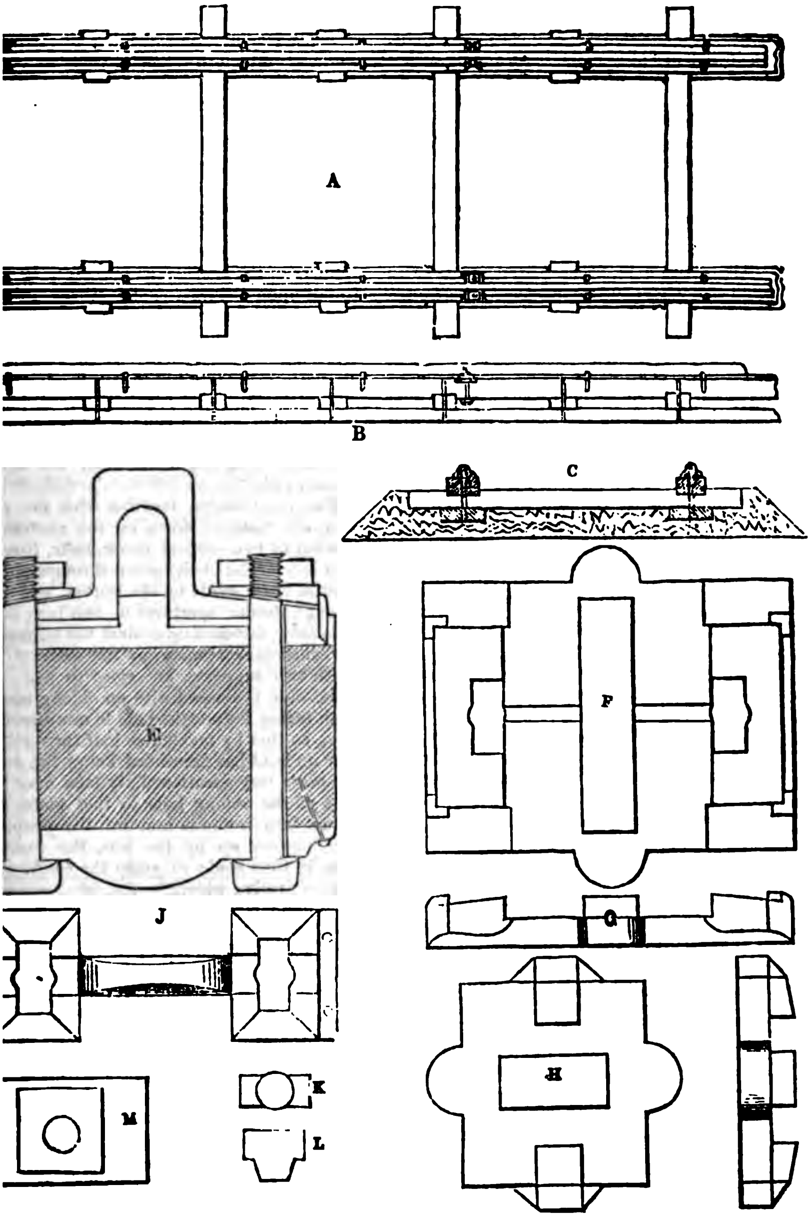
LATROBE'S IMPROVED RAILWAY SYSTEM.



DESCRIPTION OF AN IMPROVED PLAN OF RAILWAY SUPERSTRUCTURE ADOPTED ON THE BALTIMORE AND OHIO RAILWAY. BY BENJAMIN H. LATROBE, ESQ., C.E. WITH REMARKS BY ELLWOOD MORRIS, ESQ., C. E.

(From the *Franklin Journal* for March, 1842.)

The rail is of rolled iron, imported from England; it is of the bridge, trough, or inverted U section,* 3¾ inches in height, 4¾ inches in width at the base, and 2½ inches from out to out of the sides of the upright stems; the bars are in lengths of 20 feet, with their ends cut square, and weigh 340 pounds each, or 51 lbs. per lineal yard.

The rolled iron rail is supported throughout its length, by a *continuous bearing* of sawed timber, 4½ by 8 inches in section, and in lengths of 20 feet, like the *rail-bars* and *sub-sills*.

The *continuous bearing* reposes flatwise upon *cross-ties* and *bearing-blocks*, the *cross-ties* being 4½ by 6 inches in section, laid flatwise upon the *sub-sills*, and notched on the top 1½ inch deep and 8 inches wide, to receive the *continuous bearing;* this notch being cut ⅝ths of an inch deeper on the side next the centre of the track, so that the *continuous bearings* when laid on both sides, mutually decline towards each other at the rate of ⅝ths of an inch in 8 inches, or 1 in 13, thus bringing the top of the iron rail also, into a plane of this inclination, which is the same as that of the cones of the wheels now used upon the Baltimore and Ohio Railroad.

The *bearing blocks* are 3 by 6 inches in section, and 1 foot in length, they are laid crosswise to the track upon their flat sides, and support the *continuous bearing* at points intermediate to the ties, without any notching.

The *cross-ties* are laid 5 feet apart between their centres, as are the *bearing blocks*, and hence, the *continuous bearing* is supported at points 2½ feet asunder, if we measure from centre to centre of the supports, or has unsupported spaces, of but 2 feet lineal in the clear between the sides.

The *cross-ties* and *bearing-blocks* rest upon *sub-sills*, 3 by 10 inches in section, and also in lengths of 20 feet; at every point of support, the *continuous bearings*, the *cross-ties* or *bearing blocks*, and the *sub-sills*, are pinned together by *tree-nails* 1¼ inch in diameter, and going quite through the three timbers; but where the joinings of the *continuous bearing* occur above a *tie*, two *tree-nails* of an inch in diameter (one in each of the meeting ends of the *continuous bearing*) are used.

The joinings of the *rail-bars* upon the opposite sides of the track, break joint with each other midway of their lengths; they also break joint at the same time with the *continuous bearings* upon which they rest, and these in like manner break joint with the *sub-sills;* every joint of two adjacent timbers of the *continuous bearings*, is made to fall upon a *cross-tie*, and all the joinings in the track are merely square butt joints, no scarfs being used; by this system of distributing the weak and strong points, the strength of the track is equalized.

A cast iron *joint chair*, weighing 7¾ lbs. is placed under the ends of every two adjacent *rail-bars*, and a *centre chair*, also of cast iron, weighing 4 lbs. under the middle of each rail.

The *joint chairs*, together with the *rail-bars*, are fastened down on the *continuous bearing* by two vertical *screw-bolts*, (one on each side of the chair) going through oblong mortise holes made in the timber, and also, through similar apertures in cast iron *bearing-plates*, fastened up against the bottom of the *continuous bearing*, in the interval between two supports, but close to one: the *screw-bolt* is formed with an oblong square head, fitting the mortise hole in one direction only, so that by making a half turn with it after its head has descended below the *bearing plate* just mentioned, it laps over the sides of the oblong hole in that plate, and falling into a recess cast for the purpose, when drawn up by the nut, the *bearing plate* is thus made to grasp the *continuous bearing* firmly: whilst the nut being screwed down upon a wrought iron washer and zinc plate, (designed to protect the iron by galvanic action) which lap upon the projecting base, or feet of the contiguous bars of the U rail, they are thus secured to the joint chair, and the latter to the *continuous bearing*.

The *centre chair*, and the middles of the *rails-bars*, are held down on the *continuous bearing* by four *brad-headed spikes*, (each 4½ inches long and $\frac{7}{16}$ square in the shank;) and the iron rail between the *joint* and *centre chairs* is held by twelve similar spikes driven in pairs, (one on each side) at intervals of 2½ feet.

The chairs are let their own thickness

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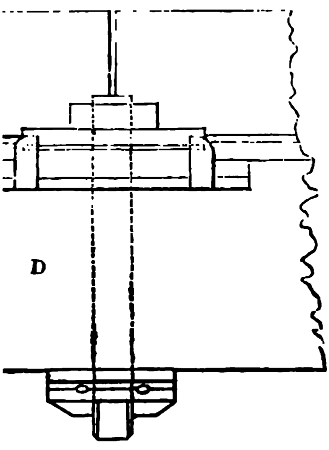
* This pattern of rail, which in section very much resembles the letter U inverted, and hence, in technical phraseology, ought perhaps to be called the U rail, was invented by S. V. Merrick, Esq., of Philadelphia, in 1831, and by him denominated the *Trough Rail* from its resemblance, when inverted, to a trough. (See the *Franklin Journal* for August, 1835.) It has been used upon the Wilmington and Susquehanna Railroad, and the Great Western Railway in England, and continues to give very satisfactory results.—*Ed.*

an inch) into the *continuous bearing*, their tops are flush with the upper of the latter, and the bottom of the rs fairly upon both.

chairs have each a projection going cally into the hollow of the rail, and izontal semi-circular projections on ds to fit into half round mortises in d, to prevent lateral motion.

centre chairs, moreover, have two projections on the upper surface, it notches of the same dimensions f an inch square) in the feet of the confine the bars from longitudinal ent.

whole of the track is laid upon, and mbedded into, a *ballasting* of broken omposing a mass of open material— pervious to water—10 feet wide at , 8 feet at top, and 1 foot in depth: er part consisting of stone broken to ery way through a 2 inch ring, and er part of such as will in like man- s a 4 inch ring: the base of the *bal-* is about 4½ inches below the bottom *sub-sill*, and its top, level with the urfaces of the *cross-ties*, or 3 inches he top of the *continuous bearing*. The : between the iron rails, or the *gauge ailway*, is 4 feet 8½ inches.



D

References to the Engravings.

eneral plan of the superstructure; B, iew of ditto; C, transverse section D, side view at the joint of the rail, g the rail and its fastenings to the ous bearing; E, cross section through ntinuous bearing at the joint of a rail; n of the joint chair; G, end view of H, plan of the centre chair; I, end f ditto; J, plan of the bearing plate; m of the screw bolt; L, cross section through the rib of the bearing plate; M, plan of the nut and washer.

Scale of A, B, and C, ⅛th of an inch to the foot, the remainder, being the *details*, are drawn quarter-size.

Remarks by Ellwood Morris, Esq., C. E.

We invite attention to the foregoing plan of railway superstructure, as embodying in a great measure, the experience acquired by the railway practice of the country.*

In 1838, Messrs Knight and Latrobe, the distinguished engineers of the Baltimore and Ohio Railroad, were specially commissioned to visit the most important railways in the United States, with the view of availing themselves of the experience of the whole country, in framing a plan for a new track, then about to be laid between Baltimore and Frederick, to replace the original superstructure, of which the wood work had decayed and required renewal, and *the stone* continuous bearings had ceased to give satisfaction.

The results of the observations of these engineers were reported to the Directors of the Baltimore and Ohio Railroad Company, in an able and elaborate memoir they discussed in detail the merits of the various plans of railway which came under their observation; and ultimately recommended a superstructure having a sub-sill and cross-ties, surmounted by a rolled iron H rail of 50 lbs. to the yard, in lengths of 18 feet, with angular joints, and for which the cross-ties formed isolated bearings of 2½ feet asunder, from centre to centre, except at the ends of the bars, where the bearings were made but 1½ feet, conformably to Barlow's experiments; this superstructure was designed to be embedded in a broken stone ballasting, of 1 foot deep; and many miles upon this plan were laid in 1839, and have since been in constant use.

Though there are, of course, some variations in the details of the fastenings, &c., the superstructure above described differs from that adopted in 1838—at the suggestion of the same gentlemen—mainly in two particulars:

* From an inspection of the railways of general trade, which have been the longest in use, the writer is strongly disposed to conclude, that it will eventually be found advisable in such railroads as carry a very heavy traffic, and the earthworks of which have acquired the requisite stability, to lay the superstructures in *a bed of concrete*, as has been suggested in the London *Mechanic's Magazine*; the expense of which, in such cases, would probably be compensated by the additional smoothness of surface, and freedom from derangement, which such a foundation might fairly be expected to impart to railways.

B B 2

1. In having *a continuous bearing of timber* beneath the rolled iron rail, upon which it rests throughout its length.

2. In the adoption of the U bridge, or trough section, for the iron rail, in lieu of either the T or H patterns.

These two essential variations from the plan of the railway superstructure, recommended by Messrs. Knight and Latrobe, in 1838, are fully justified, if not absolutely demanded, by the practical experience upon these points, now dawning upon the country; which at an earlier period in the history of railways could not perhaps have been foreseen, and certainly was not anticipated.

With regard to the first point, a close observation of such of the American railroads as have been the longest in use—possessed of the largest trade—and travelled by the heavy locomotive steam engines, which are now so common, will fully satisfy any professional man, that the alternate succession of "*rigid points and flexible spaces,*" which inevitably results from the employment of *isolated bearings*, tends to a more rapid destruction, both of the locomotive machinery and of the road itself, than is likely to ensue, where the iron edge rails are sustained upon *continuous bearings of timber* of heavy proportions; which plan has also the recommendation of having already been practically tested upon the Baltimore and Port Deposite, and Washington branch railroads in this country, and the Great Western, and London and Croydon railways in England—with satisfactory results in each of these cases, so far as the writer is informed—besides being employed upon some other important railways in America, which are now in the course of construction.

Concerning the second point, or the sectional form of the rail—we will observe that the top table of the bars, upon which the wheels run, in the T and H forms—being supported in the centre alone by a single upright stem, in thickness about one-fourth only of the width of the head—soon crushes off on one side or the other of the centre, and renders it necessary to reverse the position of the bars.

On the Baltimore and Ohio Railroad, as the writer is informed, *already* has occasion been found to reverse the position of a number of the bars (of the track laid with the 60 lbs. H rails in 1839) *whose inner flanges have partially peeled off!* and upon the Columbia Railroad, which has been *but seven years in use*, rolled iron rails of the T and H forms may be seen in every stage of destruction; and though a portion of the disintegration which may there be witnessed, is undoubtedly owing to the intrinsic structure of rolled iron, and hence can only be postponed, and not annihilated, by any change of form or pattern; still it must be admitted, that if the top table of the rail had been so supported as to prevent it from being forcibly disrupted from its vertical stem, and thus render it subject alone to the natural exfoliations, which occur when malleable iron is exposed to a series of great rolling weights, the durability of that railway would have been essentially increased.

The sort of support to the head of the rail, which practice now shows to be necessary, is given by the double stems of the U section, and not by the single one of the T figure; consequently, it seems to the writer, that experience on existing works demands in future ones the adoption of the former pattern, in outline at least; for it is a question which time alone can determine, whether we shall not finally come to a solid bar rail as the best; for the present, however, it will probably be the proper course to use the U rail as now rolled hollow, in which form, as it can be made as light as the T and H patterns, its superior durability will gradually cause rails of the latter figure to pass from use, and give place to those of the former pattern, unless a superior section should meanwhile be introduced.

To support these views, it would be easy to cite further examples of the decay of rails of the T and H forms; but it seems scarcely to be necessary, and upon the whole, we are disposed to conclude that the experience of the country, up to this time, indicates the propriety of adopting, in future railway superstructures, *a continuous bearing of timber laid with a U rail, upon a suitable substructure*, in preference to any of the other plans now in use, most, if not all of which, seem on trial to possess fewer practical advantages.

In fine, the new superstructure of the Baltimore and Ohio Railroad appears to combine in its plan a sufficient provision to satisfy the most important requisites, in favour of which the railway practice of the country has pronounced, viz.—

1. That to guard against disturbance by frost or rainy weather, the superstructure ought to be embedded in a *ballasting*, entirely pervious to water, and of a sufficient depth.

2. That to prevent the track from spreading laterally, numerous *cross-ties* should be employed.

3. That to prevent unequal settlement of the *cross-ties*, (which also form detached supports for the rails or continuous bearings,) *sub-sills* of wood are indispensable.

4. That to render the road more smooth, more equal in strength throughout, capable of carrying greater weights than roads of

isolated bearing, and exempt from "rigid points and flexible spaces," *continuous bearings of timber* ought to be employed to carry the iron rail.

5. That the iron rail itself ought to be of the U pattern, (either hollow or solid,) as superior in durability to any other known form of section now in actual use, whilst it is very stable in position, and cheap in its fastenings, when properly laid.

6. That the iron rail-bars ought to be firmly fixed at their middle parts, to cause expansion and contraction to take place both ways from their centres.

MESSRS. LILLIE AND SONS' BOILER FURNACE—INVENTED BY MR. PARKES.

Sir,—In your 976th Number, I observe a letter from your correspondent, "H. H.," from Manchester, accompanied by an engraving, in which credit is taken for the furnace, as an invention of modern date. Now, sir, I cannot avoid stating that your correspondent, while he takes credit for "simply communicating the result of private and personal experience, without fee or reward," has omitted to mention that this very plan, as adopted by Messrs. Lillie and Sons, is neither more nor less than that of Mr. Josiah Parkes, patented above twenty years ago—it is, in fact, as given in your last Number, identical with Mr. Parkes's patent.

It may just be possible that your correspondent was not aware of the fact. In justice therefore to Mr. Parkes, I beg to add this fact to those stated by "H. H." In this instance we have a striking corroboration of the truth of your observations respecting the injurious effect of the "Leeds Smoke Nuisance" pamphlet, which has thus brought forward, under the name of Lillie and Sons, a plan of twenty years' standing, and which, though possessing unquestionable merit, and in many instances eminently successful, under careful management and good "looking after," has, nevertheless, not carried the public with it, and has literally gone into disuse since Mr. Parkes himself ceased to take any interest in the matter.

"H. H." informs us that "a similar plan may be also seen at Messrs. Horrocks', of Preston." It would have been but common candour to have stated that that very furnace of Messrs. Horrocks' was actually erected under Mr. Parkes's own direction.

"H. H." observes that "in a former furnace which they had with Stanley's feeders, the consumption of coal was 20 lbs. per *horse-power per hour; they* now have a more regular supply of steam" (with Parkes's plan of furnace and air feeder by a double or hollow bridge,) from 13 lbs. of coal per hour; a saving, in this instance, of 35 per cent.; but what they strangely "estimate at 20 per cent. average." Now Stanley's plan has nothing to do with the admission of air, which is the very essence of Parkes's plan. Stanley's is in fact but a mere mechanical feeder, and is any thing but a "smoke burner."

"H. H." concludes by "relying on your willing co-operation to make this very useful plan as extensively known to the public as it is freely presented to them." To this I have only to add, that this plan so freely presented to them may be seen in the London Journal of Arts as the undoubted and legal property of Josiah Parkes, the patentee; and that "H. H." has no right to claim merit for presenting to the public what did not belong to him.

Query. Was this the boiler which lately exploded on Messrs. Lillie's premises, owing, as was stated at the time, to a deficiency of water?

I am, Sir, yours, &c.,

P.

Manchester.

MESSRS. LILLIE AND SONS' BOILER FURNACE.

Sir,—I have read in the number of your Magazine for the 23rd of April, the letter of your correspondent "H. H.," which is so calculated to mislead, that I feel assured you will readily admit a correction of its absurd errors, in relation to "Messrs. Lillie and Sons' Boiler Furnace," and certain trials of "Stanley's Feeder."

Your correspondent has made a wholesale appropriation of the paper in Mr. West's pamphlet without acknowledgment, and has thus managed to make what was already sufficiently mysterious in itself still more confused. The case appears to be simply this: Twenty years ago Mr. Josiah Parkes introduced a split bridge, admitting a sheet of air to the gases immediately as they passed over the bridge. This plan, long practised, is exceedingly well known. At Messrs. Horrocks' and Co., Preston, it has been used ever since its first introduction. This plan of Mr. Parkes', Messrs. Lillie and Sons', engineers, have introduced at their works, in Store-street, Manchester, their furnace possessing no other recommendation than good workmanship, for certainly no improvement of any kind affecting the principle of the invention have they introduced. The very same kind of furnace, as set up

during the existence of the patent, may still be seen at many old establishments in Manchester. With this explanation, what becomes of your correspondent's "appeal," in behalf of a *piracy*, for such it would be, if fortunately he were not excusable for his errors on the ground of his extreme simplicity and ignorance?

There is some incongruity in the account given in Mr. West's pamphlet, which opens with the remark, that the parties in question "have communicated a method, *never before published*," while directly afterwards we are informed respecting the main feature of the plan, that the "air is admitted into a passage through the bridge (the split bridge of *Parkes' expired patent*)."* Mr. West may naturally have thought, that the hitherto secret process pursued at the furnace at Store-street, and probably forwarded to him with a neat drawing and the inviting announcement "*never before published*," must in some of its other details be a unique gem of engineering skill. All Messrs. Lillie and Co. may have meant to be implied, was, no doubt, neither more nor less than the simple fact, that they then made known, for the first time, their having recurred to an old invention with satisfaction, never supposing that any one would start up to laud them for "a plan"—the result of "their own private and personal experience."

Your correspondent, who commences in a very pathetic strain, eulogizing those who do not make "a traffic of their knowledge or skill," evinces the possession of very little of either to traffic in, himself. He adopts a sweeping censure of Stanley's Feeder, and talks of the comparison of the present with "a former furnace," and he might have added also, a former boiler. Nothing can be more unsatisfactory than such unfair and unequal comparisons; neither the same boiler, the same furnace, nor the same grate being employed to test the consumption of the coal.

Your correspondent seems to be a very young "smoke doctor," for he first checks himself in speaking of smoke as being capable of "*combustion*," and then with admirable complacency (our plagiarist) acquaints us, that this plan, at Store-street, "is stated to have the effect of *completely consuming the smoke*." This little mosaic of right and wrong may amuse the critic, but it is not with any such feeling that I have endeavoured to expose, as briefly as possible, the most material errors committed in this instance, in a matter which is just now exciting deserved attention, and when we require the direction of correct information.

It is important to bear in mind, that furnaces of this description, to be rendered available on the best principle, are only charged with coal at starting; it is a system of slow combustion, and requires large grate surface* and ample boiler room, which circumstances are apt to be overlooked; and it generally happens that it is only when parties are on the point of "coming to business" with the engineer, to traffic in *his time and material*, if not his "knowledge or skill," that the disappointed manufacturer finds he cannot take down his Stanley's Feeder, or enlarge his grate, or get a new and more capacious boiler, or, in short, avail himself of "H. H.'s" suggestions.

I am, Sir, yours truly,

I. B.

CASTING SPECULA—MR. LASSELL'S OBSERVATORY.

Sir,—I observe in No. 965 of the *Mechanics' Magazine*, dated the 5th of February last, a letter from Mr. Robert Jones, of Newcastle, which refers in a complimentary manner to a communication I formerly made to that publication on the art of casting specula, and expresses a desire that I would prosecute the subject and describe the methods of figuring and polishing.

I have long been interested in the construction and use of Reflecting Telescopes, and if I have been able to devise any im-

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* Mr. Josiah Parkes, C. E., whose invention is here alluded to, speaking of the Argand Furnace of C. W. Williams, Esq., (see the No. of *Mech. Mag.* for Oct. 9, 1841,) very ingenuously observes in a published letter to that gentleman:—

"I am now desirous only of making a few observations on the general introduction of your system, which cannot fail to benefit its employers and improve the salubrity of the atmosphere.

"I am the more anxious to do you this justice, as it has been currently and confidently stated, that your plan differs immaterially from that patented by me, more than twenty years since. This is not correct. You have provided an important addition to my plans: viz., a more immediate and intimate diffusion of the air amongst the inflammable gases at the only place where these gases can *be encountered* and inflamed. This is a chemical *improvement which* directly leads to a practical advantage, as compared with my plan, viz., that you have no need to change materially the habits and practice of the fire men. My method requires for its perfect action a specific mode of charging and managing the furnace, which it was difficult to induce the masters to enforce or their servants steadily to practise."—Ed. M. M.

* By the engraving it appears Messrs. Lillie and Sons have a wagon boiler, only 27 feet long, with a fire-place having 2 feet dead plate, 9 feet bars, and 1 foot 3 inches clinker plate, in all 12 feet 3 inches. Seeing these disproportionate measurements, I am led to believe that the principle carried out applies equally to the boiler being unnecessarily large for the engine, and most likely even the engine not working to its estimated power.

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175-176-177-178.

, is effected entirely by the shape of ies of the chairs, which are all cast uliar accuracy. The uniformity of on attained by this improvement iminishes the lateral motion of the , observed on almost all other lines y. The chairs are placed horizon- the sleepers, and are fastened down ails of oak compressed by the patent of Messrs. Ransome and May. The mployed to secure the rails in the e similarly compressed. Details are n of the rails, which are parallel, ir upper and lower tables of equal of the amount of compression of ges and trenails, their dimensions, &c.

uthor concludes by stating, upon the of Mr. Barlow, the resident engi- hat part of the line, that the passage 0 tons of ballast over several miles permanent way" already completed, rendered the slightest repair neces- hough the weather has been very un- le.

aper is accompanied by a drawing the construction of the permanent l it was illustrated by the exhibition of sleepers with two pieces of the ed in the chairs, which were fixed h the compressed trenails, complete railway; all the tools employed in he permanent line; and specimens oak, mahogany, hornbeam, walnut, r timber, compressed and cut so as the subsequent form of the sap ves-

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swer to questions as to the com- fastenings, Mr. May explained that liarity of the system consisted in of the timber being compressed rom the circumference to the cen- pieces of wood for the wedges were with parallel sides and forced by hy- presses into tapering moulds; whilst moulds they were subjected to the heat applied through the medium of sure steam, and after being allowed they were forced out of the moulds, ng as they were kept dry would re- form; but as the operation simply ed the dimensions of the sap vessels crushing the fibre, the power of ca- attraction was not destroyed, and iven into the chair and exposed to they swelled so as to remain per- ght. There was this difference be- edges so compressed and all others; ue wedge was formed from a piece cut parallel on all sides, whilst all nodes that he was acquainted with , *not wedges but parallel pieces.* *ninution of the bulk of* the trenails, by the process, is from 100 to 63, and of the wedges from 100 to 80. It is found that the wood does not swell until it is placed in a damp situation, as in the sleepers. Even the most solid woods, such as African teak, can be compressed without sustaining injury. Perfectly seasoned timber will not shrink after compression, but green wood will shrink after the process. One of the principal ad- vantages of the compressed trenails is the firmness with which they hold into the sleeper. Around the iron spikes generally used, a sheath of rust is formed by the damp sleeper; the shaking of the carriages tends to draw them upwards, and the elasticity of the fibre around the hole in the sleeper being impaired, it is of no use to drive them down again in the same place, and the chairs even- tually become loose.

The mode of casting the chairs was de- scribed to be by placing an iron plate on each side of the pattern, ramming them up in sand, and using an iron core, which being sustained in its position by a projecting tongue falling into a groove in the side plates, preserves an uniform inclination of the rail in the chairs. Extraordinary pre- cision is thus obtained, and only about 2 per cent. of waste-castings are made, although they are subjected to a rigid test, for if the bearing points allow the rail to vary $\frac{1}{16}$th of an inch from the required inclination, they are broken up. The iron cores do not un- duly chill the metal, and the average strength is retained. The iron used is chiefly "Welsh Cold Blast."

Mr. Cubitt's object has been to lay a rail- way entirely upon transverse sleepers, of such a form as would expose the largest amount of bearing surface for the least por- tion of timber; that the bulk of the ballast should be beneath the bottom of the sleeper, where alone it is useful; to use only the best foreign timber; to have the rails rolled uniformly and sufficiently heavy; the chairs simple in form, possessing great regularity, and giving the inward inclination to the rail within the chairs, instead of depending upon the rail-layer doing it in fixing them; and that the fastenings should be simple, but firm, and not liable to breakage, or to be detached by the passage of the carriages.

With these views, he had directed four sleepers to be cut diagonally out of each square log of foreign timber, giving about 2¼ cubic feet to each sleeper; to place them with the right angle downwards, so that the ballast could always be consolidated by ram- ming, without lifting the sleeper, or digging around it, as with square, or other formed sleepers; two places are planed to receive the chairs, and one fastening hole bored in each sleeper; they are then kyanised in close tanks, completely filled with the pre-

pared solution, under a pressure of 80 lbs. per square inch. When placed upon the ballast, the joint chairs are first put down 15 feet apart, and the intermediate chairs loosely placed 3 feet apart; "cramp gauges," embracing the inside and outside of the rails, are then fixed between each pair of sleepers, and the wedges along one side driven up—one trenail being driven in each chair, the hole for which is previously bored in the sleeper by a gauge, to insure an equal projection on each side of the rail. A "guide tube," of an internal diameter to fit the spiral auger for boring the trenail holes, with the external lip tapered to correspond with the hole in the chair for the head of the trenail, is then used, and by its agency the holes are pierced with great accuracy, concentric with the hole in the chair, at the same time protecting the tool from being injured by the cast-iron. The intermediate chairs are then fixed in the same manner, and the operations are repeated for the opposite rails; the ballast is then consolidated by ramming. It is found that the work proceeds very rapidly; the ballast supports the sleepers throughout, and has no tendency to fall away from them; the water drains away freely, and hitherto the passage of the ballast wagons over that portion of the line which is laid, (although they are without springs,) has been productive of benefit rather than injury.

The inclination of the rail being given in the chair had insured such accuracy, that, after one day's traffic over it, the surface of the rails is rubbed equally throughout, and not alternately on either side, as is so commonly the case.

Mr. Cubitt did not claim the invention of the angular-formed sleeper, as Mr. Reynolds had used it before for his longitudinal bearing rails, but he believed that transverse sleepers of that form had not been previously laid down; nor did he claim the compressed wedges and trenails, or the peculiar mode of casting the chairs, the merit of these was entirely due to Messrs. Ransome and May, who had entered completely into his views and wishes, and executed them with extreme intelligence.

In answer to questions from the President, Mr. May replied that it had been an object to gain in the trenails and wedges the greatest amount of strength with diminished bulk, and also to cut away as little of the sleeper as possible in boring the holes; he had, therefore, introduced this method of compressing them, with a view, also, that in swelling from the damp they should fix themselves tight into the soft timber sleeper, and hold the chair fast down.

He hoped to extend the use of compressed trenails to ship-building, for which they were eminently adapted; if they were used, smaller holes would be bored in the timbers, and they would hold tighter than the trenails now used, which require to have the points split and wedged up, and the heads also divided and caulked, to prevent leakage through the open sap-vessels of the wood.

The President remarked that, on the Hull and Selby Railway, the chairs were fastened to the kyanized timber sleepers by uncompressed wooden trenails.

Mr. Cubitt was not aware of that fact; he had always found that uncompressed wedges and trenails would not hold tight. Some of the compressed trenails had been wetted by accident, and could not be afterwards driven into the holes in the chairs; they nearly resumed their original size, and then showed the marks of the turning-tool upon their surfaces. In answer to a question from Mr. Parkes, as to the comparative expense of laying the line, it was rather in favour of the system he had adopted, although the prices paid for the items separately were higher than usual, but the saving in labour, and the almost total absence of waste of materials, gave the economy. He then quoted a few of the prices paid; sleepers 6s. 6d. each, (ready to lay down, including kyanizing;) chairs 9*l*. per ton, free from faults in casting, the contractors for them replacing all that were broken in laying the line. Each joint chair, with three trenails and one wedge, 2*s*. 10*d*. Intermediate chairs, with two trenails and one wedge, 2*s*. 1*d*. each. The labour for laying the line was from 2*s*. to 3*s*. per yard running; the cost of fixing the sleepers, laying the rails, and ballasting complete, was from 1,500*l*. to 2,000*l*. per mile, including all expenses.

Mr. Macneill fully concurred in the importance of providing for clear drainage from the sleepers; and in the advantage presented by the angular form for ramming the ballast. The transverse sleepers, with such rails as had been used on the South-eastern Railway, were preferable to a continuous bearing, as they would prevent the gauge from widening, and preserve an uniform regularity of surface, which would tend materially to diminish the oscillating motion so common on railways, and which was so destructive to the engine and the carriages; altogether, this railway appeared to be the most perfect he had hitherto seen.

He was using, on the Dublin and Drogheda Railway, chairs of somewhat similar construction, with uncompressed wooden wedges and fastenings; they were very roughly cast in Scotland, with hot-blast iron, and the breakage was very great; they, however, cost less than 5*l*. per ton. He believed that chairs such as were cast by Ransome and May would be cheaper at 9*l*. per ton. The

ressed trenails were found in many s to become loose. In ballasting way, as stone was cheap, the whole of the line was pitched transversely in stones, and then a good bed of stone used for ballast, in the same as Mr. Telford had proceeded with lyhead Road.

William Cubitt had compressed a rable quantity of wood wedges, by them singly, by a blow of a piston, a taper steel mould; on leaving the they had attained their ultimate state pression, and they were some time they reassumed their original bulk; conceived that Mr. May's plan, by hey were dried in a compressed state, l them to retain their form longer. nsidered the systems of preparation, laying the road, to be the most perfect executed.

e years since, Mr. Horne had made a of experiments on the form of timber which presented the greatest amount ngth with the least quantity of timber; d that a triangular beam placed with se upwards was one-third stronger y other form.

Colthurst inquired whether the tre- d wedges had been found to have lost h by compressing. He imagined that ould not bear a transverse strain so before compression.

May replied that no experiments had ried as to the relative transverse h of timber before and after com- n.

S. Seaward thought it was probable nber did suffer somewhat from com- n, but that did not militate against stem, as there must necessarily be an l excess of strength in the trenails, so inconvenience could result from the .

President observed, that although un- essed trenails do draw out of the stone they hold fast in wood sleepers. und trenails used to fasten the chairs sleepers on the Hull and Selby Rail- ere of a proper size to fit the hole in ir, and at the end a square head was hich held the chair down.

Cubitt had frequently seen trenails s driven into stone blocks to receive on spikes which fastened down the he believed they had also been used through the chairs into the blocks, was not aware that they had been n wood sleepers, until he employed n the South-Eastern Railway.

nswer to a question from the Presi- Mr. Lynde explained, that upon the nd Selby Railway, trenails were cer- used in conjunction with wooden sleepers, a portion of them were uncompressed, but the greater part were compressed like the wedges; the latter were supplied by Mr. William Cubitt.

Mr. William Cubitt only supplied the wedges, they were compressed as he had previously explained; he believed that the trenails and wedges generally used upon the London and Birmingham, and other railways, were compressed by being driven through steel rings, by heavy mallets, or by a press; they were most frequently used in the stone blocks to receive the iron spikes.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

THOMAS MACAULAY, OF THE CURTAIN-ROAD, MIDDLESEX, UPHOLSTERER, *for certain improvements in bed-steps, which are convertible into other useful forms and articles of furniture.* Enrolment Office, May 2, 1842.

The improvements comprehended under this patent are embodied in four different sets of bed-steps. The *first* is a three-tier set, which includes a portable water-closet, and may be readily converted into an easy chair. The chief peculiarities of construction are, 1. The supporting of the bottom step on a pair of folding-doors, which can, by the touch of a spring, be projected or withdrawn at pleasure; 2. The making of the bottom step to turn up in front on hinges, when not wanted; and, 3. Causing the action of the top step, as it is thrown back in order to convert the bed-steps into a chair, to turn over a pair of arm-rests, or pads, on the sides of the case, which now serve as the chair-arms. The *second* is also a three-tier set, but includes, besides a portable water-closet, a wash-stand, a dressing-table, and a bidet. The contrivances by which one piece of furniture is made to serve so many different purposes are very skilful, but too numerous and minute, (though simple withal,) to admit of an abridged description. The *third* is also a three-tier set of bed-steps, but convertible into a chair only by turning up the bottom step out of the way, or removing it altogether, and making a chair-back of the upper step. And the *fourth* is a two-tier set of bed-steps, including a night-commode, and convertible, by the shifting of the steps, into a chair, which may, by means of certain rack-work, be made either reclining or not reclining. The patentee describes also a water-sealed pail of a peculiar construction, and claims it as included under his patent, when used as a part of any of the improved sets of bed-steps before described.

There is a great deal of utility, as well as ingenuity, in these improvements; and they

come in good season now that steam navigation is multiplying so prodigiously the number of travellers by sea and river, and that the *multum in parvo* is become a matter of such essential importance in cabin furniture. The set of steps No. 3 would, we imagine, be found an excellent article, as well for libraries as for bed-chambers.

Edward Robert Simmons, of Croydon, Esquire, *for improvements in apparatus for preventing splashing in walking.* Enrolment Office, May 2, 1842.

These improvements consist in applying to the heels of boots or shoes a shield, composed of a thin piece of metal, which can be taken on or off at pleasure, and which, it is said, will effectually prevent all splashing from behind, by catching on its under side the mud that would otherwise rise up and rest on the trowsers.

The claim is to temporarily applying shields to the heels of boots or shoes, to prevent splashing when walking.

In our 481st Number, for October 27, 1832, we gave an engraving of a "mud protector," communicated by a Mr. Needham, of Birmingham, which differs but little in shape from that of Mr. Simmons, and will, we dare say, be found quite as efficacious.

Jeremiah Bynner, of Birmingham, Lamp Manufacturer, *for improvements in gas-burners.* Enrolment Office, May 2, 1842.

Mr. Bynner is the patentee of what goes by the name of the "Solar Lamp." His present improvements consist in a peculiar manner of feeding gas-burners with air, whereby "quiescence in the burning of gas is produced, flickering diminished, and combustion made more complete." These objects are effected by causing the whole of the air admitted into the burner to pass through a multitude of very small orifices. The air which is introduced into the interior of the burner goes through a metal cylinder, the sides of which are perforated with a number of small holes; and that which finds its way to the exterior of the flame is made to go through a circular plate, perforated in the same manner, which plate serves also for the support or gallery to the chimney-glass.

The claim is to the dividing or filamenting the currents of air in their passage to the interior and exterior of gas-burners, in the manner above described.

John Carr, of North Shields, Earthenware Manufacturer, and Aaron Ryles, of the same place, Agent, *for an improved mode of operating in certain processes for ornamenting glass.* Rolls Chapel Office, May 9, 1842.

The "improved mode" here patented is stated to consist in the application to glass "of the process usually called by glass-stainers *printing* with materials which have not heretofore been used in that way, and under circumstances which give great facility for, and make great improvements in, ornamenting glass."

First, as regards the *staining* of glass, the improved mode of operating is stated to be as follows. "Instead of mixing the staining materials now used for that operation, when levigated finely and dried, with oil of turpentine or other volatile oils, or water, as usual, we mix them with boiled linseed or other oil, such as is now used to mix with enamel colours, when printed on glass: and instead of floating the staining materials over the glass in a liquid state, as now practised, we print them on, or transfer them as impressions from, metal plates, in the manner now adopted in the operation of printing enamel colours, and proceed, after the material transferred has been well dried, to fire it for the colour required, in the usual way. When we operate with the same staining materials, so mixed with oil as aforesaid, on what is called pot metal, or on pieces of glass which are what is called 'flashed,' opaque and transparent shades are produced, leaving the surface of the glass quite smooth, and not raised in those parts, as in the common mode of applying body colour for the purpose of shading."

Second, as regards the operation of what is called *stopping-out*, the patentees give the following directions. "We also mix the materials used for that purpose into a composition with boiled oil, as aforesaid, and transfer printed impressions on to the glass with it, as before explained, covering such parts as are not to be acted upon, and can then float over the whole surface, including the parts so stopped out, with liquid staining composition, and fire it as usual, to produce the stain; after which, the glass being cleaned, the pattern so printed on it in stopping-out materials is exhibited in the original colour of the glass, and quite distinct from the stained ground; or a printed impression being transferred to the glass in stopping-out materials, as aforesaid, the remainder of the ground may be obscured, as it is called, in the usual manner, thus producing transparent patterns on obscured grounds."

Third, As regards the operation of what is called *obscuring* glass, the patentees say: "We also mix the materials which are used to produce this effect with boiled oil, and transfer impressions from engraved metal plates on to the glass; this produces obscured patterns on transparent grounds. Now, whereas it is evident, that in all processes for ornamenting glass by staining, stopping-out, or obscuring, the means we have discovered of mixing the staining, the stopping-out, and the obscuring materials with boiled linseed oil, so as to enable us to print with

osition from copper or other en-
ietal plates, gives us the power of
nproving, perfecting, diversifying,
iplying the combinations of pat-
unds and devices, while it does not
is of the aid of enamel colours to
at diversity as usual."
im is to the use in those processes for
ing glass, where staining, stopping-
obscuring materials are employed,
mode before described of transferring
naterials in the form of impressions
raved plates of metal on to the glass,
ame manner as now practised in
in enamel on glass, namely, by
ne said materials with boiled linseed
oil, and, 2. of the application of
ing material so mixed with oil, to
l or to flashed glass generally. The
add, that by "the said improved
operating with the said materials,
nabled greatly to improve, perfect,
nore exact, diversify and multiply
binations of patterns, grounds and
or ornamenting such glass as afore-
. to produce the same, so ornament-
cheaper rate."

PATENT LAW CASE.

Court of Common Pleas.
Thursday, May 5.
(Sittings in Banco.)

Gibson and another v. *Brand.*

vas an action for the infringement of
, which had been taken out by the
for a new and improved process of
ture from silk waste, in combination
l, flax, and other fibrous substances.
, which took up three days, was held
ord Chief Justice Tindal, at the Mid-
ttings after last Trinity term. The
ad a verdict for the plaintiff on all
s except the second and third, which
ae novelty of the invention; and as
issues, they brought in a special
viz., that the invention was not new,
there was an improved process, and
new combination. A rule was ob-
Michaelmas term to enter the ver-
the second and third issues for the
it, or to enter a nonsuit on the plea
uilty, or to arrest the judgment on
issue, which related to the specifi-
A cross rule was also granted for a
l, if upon the argument the Court
e of opinion that the verdict on the
nd third issues ought to be entered
defendant.

Serjeant Bompas argued the case on
of the plaintiffs, and *Mr. Serjeant*
l for the defendant.

Court said, that before they expressed
ion as to the propriety of entering the verdict on the second and third issues for the defendant, they would dispose of the two minor questions in the case, the first of which related to a nonsuit, and the second to an arrest of judgment on the fifth issue. It had been contended, that as the grievance charged against the defendant was that he made, used, and put in practice the invention of the plaintiffs, and the evidence of infringement was a sale of some silk manufactured in the mode claimed by the plaintiffs as their invention, the plaintiffs were not entitled to retain their verdict upon the plea of not guilty. But the evidence went to show that the defendant ordered the articles to be made in the same way as the articles made under the patent of the plaintiffs, and that seemed to the Court sufficient to justify the allegation that he made, used, and put in practice their invention. There was no ground, therefore, for a nonsuit, and it did not appear to the Court that there was any sufficient foundation for arresting the judgment for the plaintiffs upon the fifth plea. The issue raised on that plea was, that the specification was sufficient, and the jury had found that it was sufficient, in point of fact, to enable a workman of competent ability to act upon it. The Court now came to the main and important question between the parties, namely, whether the defendant had a right to have the verdict on the second and third issues entered for him. The jury found upon these issues that there was no novelty in the invention, no new combination, but an improvement in the process. The question then arose whether, upon that finding, supposing it to be supported by the evidence in the case, the jury had found those issues for the plaintiffs or the defendant, and it appeared to the Court that the verdict should be *entered for the defendant on those issues.* The patent was taken out strictly and entirely for the process described in it; but upon looking at the specification, it appeared to them that the patent could not be supported in law, because the plaintiffs claimed in their specification more than they were entitled to. The Court could not read the description given of their invention without understanding them to claim the improvement in the machinery used for the purpose of producing the desired effect. Now, the finding of the jury was not in accordance with the specification, as it negatived any improvement in the machinery, and therefore the Court was of opinion that the defendant ought to have the verdict entered for him upon those issues. They also thought, upon a full review of the evidence, that there was no miscarriage at the trial, and the rule for a new trial must therefore be discharged.

Rule absolute for entering the verdict for the defendant upon the second and third issues.

NOTES AND NOTICES.

On the Protection of Iron by Zinc.—M. de Althaus, director of the salt works of Durrheim, has succeeded in protecting completely the evaporating pans of the works, 30 feet in length, by nailing to them on the outside bands of zinc; and he observes that it is not necessary that the two metals be nicely polished at the points of contact.—*Annales des Mines.*

New Propeller.—A trial was made at Liverpool, last week, of a new method of propelling steam-boats, invented by Mr. E. Finch, for which purpose a small steamer had been constructed at the engineering establishment of Mr. Rigby, at Hawarden; the experimental trip was performed in so satisfactory a manner as to convince all parties that this new propeller is of great importance, and, when fully developed, will be as generally applied to sailing-vessels as to steam-packets. The invention appears a simple contrivance; the paddle-boxes are still preserved, but, instead of wheels, two plates are applied, the broadest parts of which are at their extreme ends, fixed obliquely at an angle of 40 degrees, one on each side of the vessel, at the ends of the paddle-shaft; these plates, or propellers, are made of wrought-iron, and appear very strong and compact, and about 11 feet long and 3 feet 6 inches wide in the broadest parts: they are entirely out of the water twice in the revolution of the paddle-shaft, when the engine is on her centres, and have the deepest hold of the water when the engine is at half stroke, or at its greatest power. They thus act like oars, or sculls; no back water is created, and the disagreeable beating of the paddle-boards on the water, and subsequent vibration of the vessel, is avoided.—*Mining Journal.*

Electro-Magnetism as a Moving Power.—The Consul-General of the Netherlands, in a communication dated the 18th ult., quoted by the *Mining Journal*, thus announces the removal of the hitherto great obstacle to the practical application of electro-magnetism as an effective propelling power:—"A private gentleman, Mr. Elias, of Haarlem, has just published the description of a new machine invented by him, for the application of electro-magnetism as a substitute for steam. The object of the inventor has been chiefly to remedy the defects which, in 1839, rendered the otherwise ingenious invention of Mr. Jacobi, of St. Petersburgh, a total failure, in as far as practical utility is concerned. Those defects originated, it seems, in the erroneous supposition that the power of the magnetic bars exclusively resides in their extremities—whence the form hitherto given to all electro-magnetic machines—viz., that of a horse-shoe—which, while it occasions an unavoidable interruption of the magnetic stream at each new inversion of the poles, at the same time leaves the power resident in the remaining part of the bars wholly unemployed. The new invention of Mr. Elias, on the contrary, has the very great advantage of rendering effective the full power of the magnetic stream uninterruptedly, and throughout the whole body of the apparatus. This consists of two concentric rings of soft iron, standing on the same plane, of which the external one is immovable, while that on the inside revolves round its own axis. By means of a piece of copper wire, wound about each of these rings, he has given them six magnetic poles, placed at equal distances from one another, the whole being so contrived that the one ring exerts its inducing power on the other throughout the whole circumference, and always at the same distance. A small, but very perfect, model of this important invention is now open to public inspection here; and the result of its operation is allowed, by those skilled in such matters, to be such as to ensure the most triumphant success."

Ancient Bronze.—Among the Egyptian antiquities in the British Museum there are several chisels, saws, and other tools, made of bronze; and also remains of granite sculptures, which, supposing them to have been executed with these tools, show that they must originally have been of a hardness and temper equal to that of our best modern tools of iron and steel. No Egyptian tool of iron has ever yet been found; nor is there any trace of this metal having been used for such purposes in the days of the pyramids. A small bronze knife, found at Thebes, was, after being buried for at least 2,000 years, of so good an edge, that it was used for a penknife several months after its exhumation. How the Egyptians contrived to obtain bronze of so superior a quality is now unknown; it is one of the lost arts, the re-discovery of which, (chiefly, however, on account of the rust-proof property of this compound metal,) would be worth a diadem.

Aerostation in Ireland.—We understand that Mr. Charles Green, whose long and persevering exertions to perfect aerial navigation are deserving of so much praise, will most probably gratify our friends of the sister island by making some ascents from Dublin, in the course of the present summer. Not, however, in the "Great Nassau," (which is a pity,) but in some balloon of inferior magnitude; for, strange to say, there is not as yet a gas establishment in Ireland which could afford sufficient gas for the inflation of so vast a machine.

Ericsson's Steam Fire-engine Revived in America.—When I left New York, it was rumoured that the several insurance companies of that city had determined to have fires put out, thereafter, by steam.—They were having built a powerful steam fire-engine, to cost 6,000 D. It was building on a plan of Ericsson's, the inventor of the transversal screw-paddle for steam-ships. The engine was to weigh a little more than two tons, to have the power of 120 men, and to throw upwards of 3,000 pounds of water per minute, to the height of above 100 feet. Its power, and the quantity of water to be thrown, to be greatly increased over that which I have stated. It was to be called "Exterminator." Able engineers are of opinion that it will perform the work of at least six of our best engines, and it will have the advantage of a power that will never be worn out by fatigue. The bore to which the hose will be attached is *fifteen* inches and three-quarters in circumference, and the mouth of the pipe will be much less—giving a great impetus to the volume of water, and throwing it to a greater distance than our best engines. It is so constructed, that, should it be necessary, three or four streams can play from the engine at the same time. The engine will be stationed in the fifth district, probably at or near Burling Slip. It is to be drawn by a pair of strong horses, and attended by a driver, an engineer, and a fireman.—*Le Crus's United States and the Canadas.*

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No. 980.] SATURDAY, MAY 21, 1842. [Price 6d.
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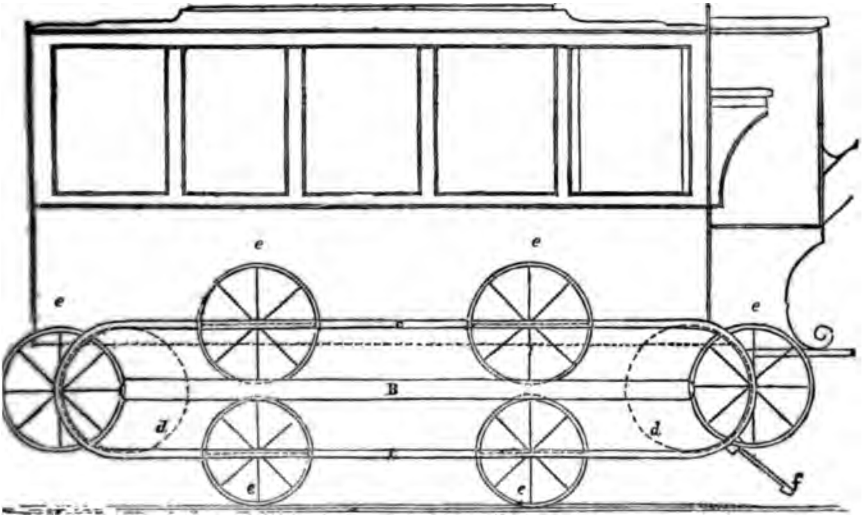
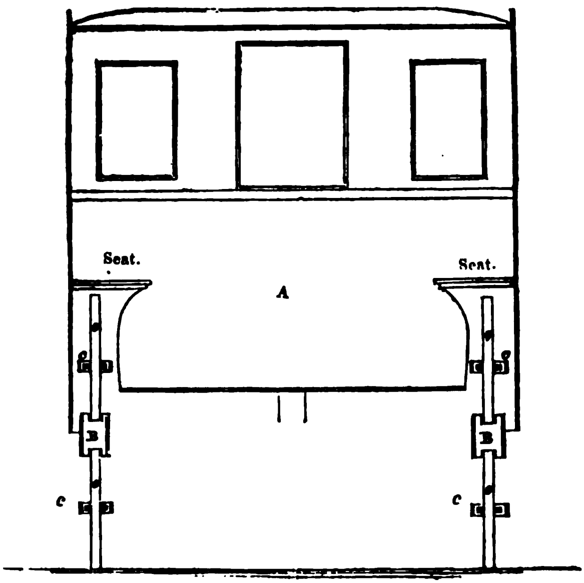
ROBINSON'S ROLLER CARRIAGE.





DESCRIPTION OF A CARRIAGE TO BE PROPELLED ON ROLLERS INSTEAD OF WHEELS.—DESIGNED BY MR. GEORGE ROBINSON.

Sir,—In accordance with your wish, I send you a description and sketch of a design for a carriage to be propelled on Rollers instead of Wheels. Yours, &c.,

GEO. ROBINSON.

Description.

A, is the body of the carriage, which is represented as an omnibus, but may be of any form.

B, a strong side frame with circular ends, 6 inches wide, with a groove 4 inches wide, and 1 inch deep, running round its upper and under surfaces and ends.

c c are guide-rails, of which there are two on each side the carriage; they are placed as seen in the side view—equally above as below the frame, and supported from it by brackets. One rail projects 2 inches *within*, and the other, 2 inches *without* the frame; both have a groove 1 inch square running round their faces next the frame.

d d are grooved friction-wheels so fixed as to turn freely on their axles within the ends of the guide-rails next the frame: they are slightly less in diameter than the span of the rails—their circumferences travelling just within the groove round the ends of the rail. An endless chain (not shown) composed of flat jointed links extends along the face of the grooves of the guide rails, passing over the friction-wheel at each end.

e e e e e e are wheels 2 feet in diameter and 4 inches broad at their circumference, fixed on small axles, which project 4 inches on each side.

These wheels are converted into rollers by distributing them at uniform distances around the frame, with their peripheries in the groove; their axles passing through a circular hole in the chain provided for that purpose, and into the groove in the guide-rails by which they are held secure and steady; the *whole weight* of the carriage resting on their peripheries; and their axles traversing the grooves nearly without friction.

Motion being given to the carriage, the friction of the rollers on the ground, by the tension of the chain, communicates motion to the whole series, insuring an uniform and continuous rotation.

It will be seen, by the cross section, *that the upper* series of rollers revolve *under the seats,* obviating the necessity of any additional *breadth* to the carriage. The whole being neatly cased in as low as the frame, the carriage will be as compact and elegant as any other. The body may be mounted on springs in the ordinary way.

f is a scavenger of a wedge-like form, projecting in front of the rollers, and a little above the ground. This scavenger being fixed in a tube, down which it is pressed by a spring, would serve to remove obstructions, by causing them to glide on either side; and on contact with any thing fixed, or above a certain weight, the spring would yield, and the scavenger being pressed backwards and upwards, would clear the object.

I have described this vehicle as adapted for horse-draught on common roads. But instead of the frame being grooved, and having flanges to the rollers, propellers to be brought in contact with the ground, (such as I have imperfectly attempted to describe in No. 975), may be used, or motion communicated to the friction-wheels by steam agency, when it will be applicable to railroads as at present constructed.

For steam on common roads it would require, in addition, a *guide*-wheel, so fitted as to be instantaneously available in turning, but used *only* when wanted.

This description of machine would, I think, have considerable advantage over the ordinary ones, in consequence of the amount of friction *in them* generated in the box of the wheel; the turning of which round the axle is, I conceive, similar to the raising of the load, by pressing under it a series of wedges; each portion of the box, as it comes round, having that duty to perform by being pressed under the axle, by which it is, in reality, constantly ascending an inclined plane—thus creating a large amount of friction. Whereas, on rollers the carriage has a level surface to travel on, and, as it is known that the friction of the periphery on a smooth good road is small, compared with that exisiting at the axles of wheels, so the friction generated in the passage of the rollers along the grooves of the frame, will be small also—the only friction at the axles, being that generated by the weight of the upper series of rollers in the act of being drawn forward.

G. R.

London, April 5, 1842.

BOOKS ON GAS-LIGHTING.*

ie fifteen years ago, when gas-
g was as yet but in its infancy, we
ber to have had occasion (vol. viii.,
) to find fault with the generality
works then written upon it, as re-
ble for a "disgraceful intermixture
ckery and false pretension;" and
e had subsequently a correspond-
of not the most pleasant character,
Mr. Thomas Snowdon Peckston,
ithor of "A Practical Treatise on
ghting," respecting the extent to
he was entitled to exemption from
reeping censure. (Same vol., pp.
95. 414. 445.) We certainly did
ink Mr. P. one of the quite exempt;
might, at the same time, perhaps,
airly conceded more merit to him
re then did.
t we were not more liberal of praise
. Peckston was owing, in a great
re, to Mr. Peckston's own per-
blindness to the claims of others.
d greatly offended our sense of jus-
y attempting to wrest from Mr.
the authorship of one of the most
ous of his many useful inven-
(the meter), and to disparage gene-
the importance of that gentleman's
unrequited) services to the gas-
manufacture; though there is no
, nor, indeed, any number of per-
who can be named, to whom it is
extensively and lastingly indebted;
we could not recommend his work
ut assisting to give currency to its
false and ungenerous views on these
, we were at no pains to ascertain
its merits might be in other re-
. It had one great blot in our
which prevented our seeing any
else.
e work now makes its appearance
e us again, after the lapse of many
, in the form of a new edition (the
); and vastly the better for the cor-
g hand of time. Mr. Peckston
ved to feel conscious of most, if not
e injustice of which he was guilty towards Mr. Clegg. He still persists in claiming for another (Mr. Malam, his brother-in-law,) the invention of the meter (of which more by and by); and in no place speaks of Mr. Clegg with perfect cordiality of approbation. But he does now admit, in point of fact, though usually in a reluctant, and sometimes in a most ungracious tone, that Mr. Clegg is without a compeer in this branch of art. "The preponderance of his claims to notice over those of others is undeniable." p. 93. Mr. Peckston has, besides, lived to know himself a great deal more of the art of gas-lighting than he did when he first wrote about it. He has, it appears, been ever since practically engaged, with but little intermission, in the designing and erecting of gas-works in different parts of the three kingdoms (Preface); and while thus gathering many new lights from his own practice, has not been an inattentive or unprofiting observer of the practice of others. What, therefore, was originally but the slender work of a very slender novice, has now grown, in the course of years, into the well-filled treasury of a man of extensive experience and approved talent. Indeed we may say, that what with rectifying those parts which were erroneous—expunging such as have become obsolete, or were never much to the purpose—amplifying others that were exhibited but in outline—and adding the many new inventions and improvements which the last 15 years have produced—Mr. Peckston's treatise has become, under his hands, quite a new book: and a good book too, which, in spite of the taint of personal prejudice, of which we have before spoken, and of two or three other serious exceptions, to be presently noticed, will be found of great practical value to all concerned, either as engineers, manufacturers, or consumers, in the gas-light manufacture.

It is a curious coincidence, that the same year which has witnessed Mr. Peckston's re-appearance as an author before the public, should have produced a powerful competitor to him in that capacity, in the son of the very Mr. Clegg whose merits Mr. Peckstone has been so tardy in recognizing, and to whom he still makes such imperfect amends. If it be, as we suspect, that a natural de-

Practical Treatise on Gas-Lighting. Third
n, carefully corrected, and adapted to the pre-
nproved State of the Manufacture of Gas. By
s S. Peckston, R.N., Civil Engineer. 8vo,
. With Twenty-two Plates. Hebert, London.
Practical Treatise on the Manufacture and
ution of Coal Gas, its Introduction and pro-
e Improvement. Illustrated by Engravings
Working Drawings, with General Estimates.
uel Clegg, Jun., C.E. 4to, pp. 200. Weale.

sire of vindicating a father's fame has had a principal share in making an author of the son, Mr. Peckston may read in this fact a valuable lesson on the advantage, in the long run, of even-handed justice.

But the "Practical Treatise" of Mr. Clegg, jun. (for, as if more peremptorily to challenge comparison, he adopts the same title as Mr. Peckston) is no family affair. There is, in truth, much less of the son in the one book, than there is of the brother-in-law in the other. To write a complete and true history of the rise and progress of the gas-light manufacture, without making more frequent and prominent mention of Mr. Clegg than any other person, is, for the reasons before stated, impossible; and such a history is simply what Mr. Clegg, jun., has achieved, with far less indulgence in language of praise towards the chief actor in it, than might have been expected, and would readily have been excused. Anxiety to place the services of a near relation fairly before the public, has not prevented *him* from doing everywhere full justice to the claims of others. He has enjoyed, he tells us, "access to, and the free use of, his father's manuscripts and notes—the result of his long labours and experience in this department of engineering;" and so far he has had greatly the advantage over Mr. Peckston and every other writer on the subject. Mr. Peckston's experience dates no farther back than about twenty years, but that of Mr. Clegg, sen., embraces twice twenty years—goes back, in fact, to the very origin of lighting by gas. Mr. Clegg, jun., has brought, besides, to the execution of his task, talents and attainments of his own of no mean order; some considerable experience, too, acquired under the immediate eye and fostering care of the Nestor of the art; and of these personal qualifications the volume before us exhibits many pleasing proofs.

The early history of gas-lighting is related much in the same way in both Treatises; and is, in its general features, familiar to most readers. The following incidents, which we quote from the Clegg treatise, we do not remember to to have met with before:—

SIR HUMPHREY DAVY ON GASOMETERS.

"The great prejudice entertained against the introduction of gas-lighting, not only by the public, but also by men of science, seemed at one time to present an insurmountable obstacle to its further progress. Lighting a town with gas was still thought a visionary scheme. Sir Humphrey Davy considered the idea so ridiculous, that he asked "if it were intended to take the dome of St. Paul's for a gasometer?" to which Mr. Clegg replied, that he hoped to see the day when gasometers would not be much less. They are now (1841) made 100 feet diameter, and 39 feet deep."

ROYAL SOCIETY SCIENCE AND WISDOM.

"After the works at Peter-street had been some time in operation, Sir Joseph Banks and several other members of the Royal Society were deputed to examine and report upon the gas apparatus. The deputation strongly recommended Government to oblige the Company to employ gasometers embracing not more than 6,000 cubic feet, *secured in strong buildings*. As Sir Joseph Banks, and some of the other members of the deputation were considering on the danger of a leak in the gasometer if a light happened to be near, Mr. Clegg called to a man, desiring him to bring a pick-axe and candle; he then struck a hole in the side of the vessel, and applied the light to the issuing gas, to the no small alarm of all present, most of whom quickly retreated; contrary to their expectation, no explosion resulted from the experiment. This practical proof, however, did not seem to convince them of their error, and the Chartered Gas Company was put to considerable expense in making small gasometers surrounded by strong buildings."

DIFFICULTIES IN PUSHING A NEW TRADE.

"The Chartered Gas Company at first fitted up and supplied shops and houses with gas *free of expense*, in order to induce others to adopt the plan; so things went on for nearly two years, with only a few retorts in action.

* * * *

"On the 31st of December, 1813, Westminster Bridge was lighted with gas. The lamplighters were much startled with the new system, and refused to act, and Mr. Clegg had himself to light the lamps for a few nights.

* * * *

"When gas lighting was first brought into use, no proper chandeliers, brackets, stopcocks, &c., for the fitting up of shops, were to be found; no one was willing to embrace their manufacture, considering it as a hopeless scheme; Mr. Dixon was the first to begin."

THE SECRET OF THE FIRING OF THE PAGODA IN ST. JAMES'S PARK.

"On the occasion of the Illumination for

e of 1814, when the Allied Sove- isited England, the devices in gas r exceeded in splendour anything · since exhibited; the principal il- on was a pagoda, erected by government in St. James's park. goda was octagonal, composed of ghty feet high, at each angle of which ated pipe was fixed; a projecting also placed at every angle of each the form of a griffin's head, pierced ll holes, through which issued jets At the lowest orifice of each per- ar pipe a small oil lamp was con- hich, when lighted, ignited the first s; this communicated the light to jet, and soon to the summit. The f each angle were thus simultaneously and the gas light rose into the air majesty of a rocket; and the pagoda ed by more than 10,000 burners, in a few seconds, the whole appear- mass of living light. This device unately exhibited to the Prince and most of the royal family, at their on the night previous to the general ion; their highnesses walked in gardens to witness the effect, and l great approbation. The night on is first grand display of gas lighting ive been exhibited to the public, Sir Congreve, contrary to Mr. Clegg's d request, insisted upon letting off from the pagoda, before the gas e turned on; the consequence was, whole erection was burned to the The accident was not only mortify- ccount of the expense and trouble by the Gas Company in this affair, more unfortunate, as gas lighting been lately introduced, and all new (as great improvements are gene- ed) have many enemies. A report ad abroad the following day, that the set fire to the pagoda; the public r entirely undeceived."

dvantages of gas lighting, as con- ith artificial light obtained from urces, are very fully discussed in eatises. Mr. Peckston concludes hapter of directions for ascertain- comparative illuminating power of wax and tallow candles, wick nd gas lamps, with a Table of re- om which it appears that when 9*s*. per thousand cubic feet, is the best advantage, which is in a ole argand, with a flame three feet t, the comparison stands as fol- One gas lamp supplies as much r 4*l*. 2*s*. 2*d*. per annum as would *l*. if procured from tallow candles at 8*d*. per pound, or 43*l*. 10*s*. if from wax, at 2*s*. 6*d*., or 15*l*. 15*s*. if from sperm oil at 9*s*. per gallon. Mr. Clegg's estimates differ considerably from these, which apparently arises, in the first place, from his making allowance for the increase of illuminating effect consequent on any increase in the specific gravity of the gas—a very necessary element in the calculation, but not taken into account by Mr. Peckston in his Comparative Table, though made the subject of a special notice towards the end of his work, (as if it had been an afterthought;) and, secondly, from his adopting higher rates of cost for the gas, and lower for the contrasted articles than Mr. Peckston has done. Mr. Clegg's estimate is that 6,000 cubic feet of coal gas of the specific gravity ·400, when supplied with a sufficient volume of oxygen for its complete combustion, is equal to the light from 2,400 candles, eight in the pound; and that the difference in favour of the gas at 12*s*. the 1,000 cubic feet, (a high rate,) is compared with tallow candles at 6½*d*. per lb., (a low rate,) as 15*s*. 1*d*. to 27*s*. 1*d*.

It seems to be agreed that coal gas cannot be manufactured with economy by means of any apparatus at present known *on a small scale*. The point of economy does not, however, descend so low but that every town in the kingdom without exception, might be lighted with gas at a profit. Mr. Clegg gives a statement of the outgoings and receipts of a country gas establishment for 64 public and 72 private lamps, which exhibits an annual profit of no less than 191*l*. 7*s*. 10*d*. The inducement to erect such establishments is the greater that there is no variableness in the results—no chance of loss one year to be set off against the profits of another.

"Upon a well-regulated system, the cost of producing every 1,000 cubic feet of gas with the same coal, will not vary one penny the whole year round; the quantity of gas made will be adequate to the demand, and no more. The wear and tear of the machinery will be exactly that which was anticipated, and therefore the annual outlay will be known; the sale of the products of the establishment may be depended upon with equal certainty, and the income, with the profit arising from the difference, is thus obtained."—*Clegg*.

"The price of coals can exert but little influence upon the price of the gas produced from them, for where coals are plentiful it

follows that they will be cheap, and hence also will be the coke produced therefrom; but where coals are dear, the coke will also sell for a higher price, and find a more ready market."—*Peckston.*

In the early days of gas-lighting, the quantity of gas obtained from the distillation of a ton of coal did not much exceed 6,000 cubic feet, by the consumption of half a ton of coal for heating the retorts, but so great have been the progressive improvements in this branch of the art, that the product per ton is now seldom less than 9,000 cubic feet, and amounts frequently to much more; while the fuel expended on the carbonization has been reduced from 50 to 25, and in some cases to as low even as 16 per cent. Among these improvements, the principal have been, a reduction in the size of he retorts from 20 inches to 12 and 10 in diameter, so as to admit of the coal being carbonized in thin layers—the substitution for circular retorts, of retorts of a form more or less approaching to the semicircular—and the setting of these retorts, of whatever form in ovens, instead of subjecting them to the direct action of the fire. Mr. Peckston gives the preference to retorts of an elliptical form over all others, and there was a time when he claimed the invention of that form for his friend Mr. Malam, though in his present edition he does not once mention Mr. Malam's name in connexion with it. Mr. Clegg seems to prefer the D-shaped retorts, but not very decidedly, and with a disingenuousness, which is unusual with him (indeed this is almost the only instance of the sort we have observed,) does not once notice the elliptical.

According to Mr. Peckstone, there is a saving of 2,806*l.* to be realized on the production of 44,598,684 cubic feet of gas per annum by the adoption of elliptical retorts; and this is advantage enough, to entitle the data on which it is founded to the most attentive examination.

Retorts made of *fire-clay* instead of *iron*, have been adopted. Mr. Peckston says they "were thought likely to be very durable, and also to produce very extraordinary results; but on being tried they were found neither to possess durability, nor to effect any other advantages over cast iron retorts of the same shape and size:" and with these general observations he dismisses them to the lumber-room of oblivion. The reader (not conversant with gas-lighting statistics) will be surprised when we tell him that the fire clay retorts thus contemptuously disposed of by Mr. Peckston, have superseded the use of metal retorts in no less than forty towns in England and Scotland—that in some instances, they have lasted for the extraordinary period of twelve years (which is just about twelve times the duration of iron retorts), that at the gas-works in Cambridge there are fire clay retorts which have been in operation for upwards of seven years, and are now in as sound and efficient a state as on the first day they were set to work; and that besides being so exceedingly durable, they produce more gas from a given quantity of coal. Mr. Peckston's statement on this head is in every particular, in fact, in direct and most unaccountable opposition to the truth. The causes of the superiority of the fire clay retorts will be found explained in the following extracts from Mr. Clegg's Treatise:

"It appears that clay retorts have great power to *retain* their heat, when brought to the proper temperature for decomposing the coal, viz. 27° of Wedgewood, and the introduction of a fresh charge is not nearly so much felt by them as by metal. This is a *practical* point—one which I have been at much pains to ascertain, and which I would not state were I not convinced of its correctness by personal observation. Mr. Grafton, the inventor and patentee, afforded me every facility for experiments, and is willing to do so to all who have a desire to test his retorts. This power of retaining heat is proved by constant practice to produce 1,000 cubic feet of gas per ton from the same coal more than the average of the London produce, and the consumption of fuel is not more than 22 or 23lbs. of coke to carbonize 100lbs. of Newcastle coal, taking the average of six months' working; it is even less with the Staffordshire or Lancashire coal. When properly constructed, these retorts are not in any degree liable to fracture, or to the escape of gas, but are of such strength as to resist the greatest pressure which is likely to be put upon them. The coke, also, made by them is also considerably of better quality, and produces less breeze or waste. The advantages of the fire clay retorts, combined with their great durability, will ere long be generally acknowledged and their use will consequently be more extensive."

The gas, after it leaves the retorts, has

to undergo several processes of purification before it is fit for use; of which the most important is the passing it through lime more or less slaked with water, in order to free it from the sulphuretted hydrogen with which it is always largely intermixed. Mr. Peckston states, "that when coal gas was first employed for the purpose of procuring light, it was allowed to proceed to the place where it was intended to be burnt, without undergoing any purifying process other than passing it through water; and *it appears that some time elapsed* before lime and water were used as a purifying medium." (p. 233.) Mr. Clegg, he elsewhere says, "*put up* the first purifier." (p. 93.) We regret to have here again occasion to find fault with Mr. Peckston for grossly offending (from ignorance it can hardly be) against the truth of history. The first gas apparatus ever erected (1805) was that at the cotton mill of Mr. Henry Lodge, of Sowerby Bridge, near Halifax; the second, that of Messrs. Phillips and Lee, of Manchester (1805); the third, one for lighting the private residence of Mr. Lodge (1806); the fourth, Messrs. Knight's, of Longsight (1809); the fifth, Mr. Harris's, of Coventry (1809); and the sixth, that of the Catholic College of Stonyhurst (1811); the whole of which were erected by Mr. Clegg, with the exception of the second, which was erected by Mr. Murdoch, who had, by some previous experiments on a small scale, at the Soho manufactory, demonstrated for the first time the practicability of lighting by gas, and acquired thereby a just title to be regarded throughout all time as the father, or inventor, of gas-light illumination. Now, in the third of these cases, it was attempted to purify the gas by introducing lime into the tank of the gasometer; in the fifth, a paddle was added, to agitate the lime; and in the sixth, the gas was passed through a separate vessel filled with lime water, previous to its entering the gasometer,—the mode of purification which has continued to be followed, with but little variation, to the present day. The "some time," therefore, which Mr. Peckston tells us, "elapsed before lime and water were used," amounts, as nearly as possible, to just no time at all; for Mr. Clegg made use of it in the very second apparatus he ever erected, which was within less than a year of the first; and there were not in all more than two sets erected without such an appendage—Mr. Clegg's first, and Mr. Murdoch's first. Nor did Mr. Clegg merely "*put up* the first purifier," as Mr. Peckston, with most ungenerous stintedness of phrase, relates; he was the true and first inventor of the thing; he instantly perceived that without purification there was to be no progress made in the application of coal gas to purposes of illumination; and almost as instantly, by the resources of his very inventive genius, overcame it.

Mr. Peckston is not, we regret to say, the only individual at whose hands the claims of Mr. Clegg, in respect of this invention, have been unfairly slighted. In 1808, Dr. Henry communicated to the Royal Society a paper, in which he described the application of lime water, on a large scale, for the purification of gas from sulphuretted hydrogen, as a contrivance of his own; though, as we have seen, it had been reduced to practice by Mr. Clegg two years before; and Dr. Henry appears, from circumstances stated by Mr. Clegg, jun., to have been well aware of this fact.

We come now to the invention of the meter, by which the gas, after it has been made fit for consumption, is measured out to the consumers. The long standing dispute between Mr. Clegg and Mr. Malam (or rather Peckston *pro* Malam) on this subject, is now reduced by admissions on both sides to so narrow a point, that there is happily little left for us to do, beyond recording the agreement at which the disputants have arrived. "Some one may say," quoth Mr. Peckston, "that Mr. Malam only invented the L pipe and receiving chamber; *be it so;* if that be admitted, the rest follows, for the former completely changed the mode of entrance of the gas into the meter, and removed the great obstacle to the action of such an instrument." p. 367. "The merit," says Mr. Clegg, jun., with admirable candour (under all the circumstances,) "of applying a pipe on one side of the axis to convey the gas into the meter, *is due to Mr. Malam*—decidedly the most important improvement since its invention." p. 22. Nothing could be more distinct or unreserved than these reciprocal admissions, that Mr. Malam but improved what Mr. Clegg invented; yet it will hardly be believed that, in spite of Mr. Peckston's "be it so," he is not content that it should rest so; for he still persists every

where else in speaking of Mr. Malam as "*the inventor* of the gas meter," not the improver of it; and in order that a due share of solemnity might not be wanting to crown this intolerable inconsistency, he gravely adds, "we do so under the most perfect conviction that we are correct!"

A word or two before we leave this subject on the conduct observed towards Mr. Clegg and Mr. Malam, by that very sapient and eminently useful and respected body, the Society of Arts. In the summer of 1838, Mr. Clegg sent to that Society an account of his then still novel experiments in gas lighting, and the sages of the Adelphi, in order to testify to all future generations, how sensibly alive they were to the vast importance of the new art—how grateful to its most assiduous and successful, if not earliest cultivator—and how munificently liberal of encouragement to perseverance, awarded to Mr. Clegg their *silver* medal! But when, fourteen years afterwards, Mr. Malam presented himself to their notice as the inventor of the meter, which it is now established, past all dispute, he only improved—with this feather in his cap, snatched from the plume of his early master and preceptor, (Mr. Malam was originally a draughtsman in Mr. Clegg's office,) the Society, with the same magnanimous regard for the claims of genius, and the interests of science, which they had before displayed—with the same keen solicitude to show how well qualified they were (as every one knows they still are,) to sit in judgment on matters of this high import, awarded to the pretender-pupil for his single borrowed feather, the highest mark of approval in their power to bestow, namely, their *gold* medal! Who can but wonder that so nice a society as this should ever have fallen into decay?

The "Distribution of gas through Mains" forms the subject of an excellent and most useful chapter in the Clegg Treatise, but it is only very partially treated of in that of Mr. Peckston. It includes a set of "Tables of the different quantities of coal gas of the specific gravity ·420, delivered in one hour from horizontal pipes of different diameters and lengths, and under different pressures," which will be found of great practical value to all gas establishments. It *appears to be well* ascertained that the *quantities of gas* of any given specific gravity, discharged in equal times by horizontal pipes of different lengths, under the same pressure, are to one another in the inverse ratio of the square roots of the lengths; and also that the obstruction to the flow of gas through pipes is very nearly as the number of bends—two semicircular bends, for example, making twice the difference, three bends three times, and so on.

For regulating the flow of gas at the point of inflammation, both Treatises agree in recommending Platow's double cone burner as the most efficient. "This arrangement causes the light produced to burn steadily, and renders it very soft and agreeable. A saving of gas is effected by its use, amounting to about 10 per cent., whilst the heat generated, thereby is proportionably less than when the common Argand burner is used."—*Peckston.* "This description of burner is by far the best Argand, and should be universally adopted."—*Clegg.*

The "Secondary Products" of gas establishments, as coke, coal tar, ammoniacal liquor, naphtha, &c., are more sparingly treated of by both writers, than their importance in an economical point of view demanded. We quote from Mr. Clegg's Treatise the following notice of an application of the naphtha, lately discovered by the ingenious Mr. Lowe, which seems to promise very important results.

Naphthalizing Coal Gas.

"If coal gas is conducted through naphtha before being burned, the light is increased in brilliancy more than 50 per cent. I witnessed an experiment on this at Mr. Lowe's house, a few weeks ago, and certainly the effect was dazzling. The naphtha was contained in a sponge placed in an air-tight cap or vase below the burner. Mr. Lowe has also obtained this increase of illuminating power by filling the meter with naphtha, and thus describes his method:—

"As it regards the first part of the same, or increasing the illuminating power of such coal gas as is usually produced in gas works by impregnating such gas with naphtha, commonly called spirit of coal tar, or with any other volatile hydro-carbonaceous liquid: the method I adopt for so impregnating the said gas, is by merely filling the case of the common gas meter to the usual height, with any of the said liquids instead of water, by which means the said gas discharged by the meter to the burners is during the operation of measuring, sufficiently impregnated with the said liquid in the meter case."

Neither Mr. Peckston nor Mr. Clegg take the least notice of Mr. Gurney and

his Bude Light; and we must confess that we are not a little surprised at the omission. We believe its merits have been greatly overrated; but be this as it may, considering that it has engaged so much of parliamentary and public attention, and has been preferred before all others for lighting the Hall of the Collective Wisdom of the country, these facts ought to have sufficed to procure for it a prominent place in works professing to give a complete history of gas-lighting in all its more important practical applications.

INSTRUMENT FOR DRAWING ELLIPSES AND OVALS.

Sir,—Having contrived an instrument for drawing regular ellipses and ovals, or egg shapes, which I find answers the purpose extremely well, I send you a drawing and description of it, in the hope you may deem it worthy of a place in your Magazine.

Your correspondent, "H. P.," would oblige by giving his opinion as to the nature of the curves traced by this instrument, which I believe will be found very useful, as it is quickly set and very easily used.

I am, Sir, yours respectfully,

SAMUEL MILBOURNE.

Charles-street, Middlesex Hospital, London.

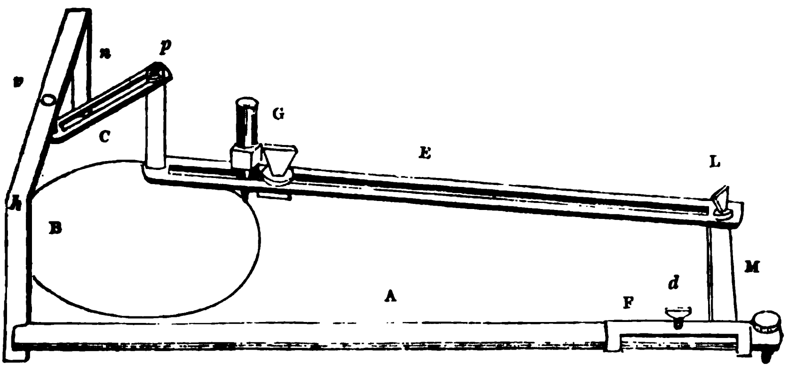


Fig. 2.

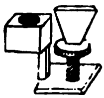
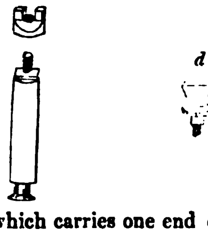


Fig. 3.



Description.

A is a round bar of steel, 12 inches long by ¼ inch thick, having a flat bar B, brazed on it send *r*, and bent twice at right angles, so that its feet *n* and *o* may rest on the drawing paper. To the centre of B the revolving bar C is so riveted as to allow the nut *p* to pass under B without touching. The cylindrical piece D is riveted so as to turn freely in the end of the tracing bar E, its upper end being shouldered and tapped, so that it can be fixed to any part of C by means of the nut *p*. F is a piece of brass tube, which slides freely on the bar A. To F is brazed the arm M, which carries one end of the tracing bar E always in a straight line parallel with the bar A; and the other end of E being carried in a circular path by the bar C, all points along the middle of E between D and the screw *d*, will move in an eliptic path; the situation of D on the bar C determining the length of the major axis, and the situation of the pencil on E determining the minor axis of the ellipse. Thus, the major and minor axes of an ellipse may be varied in any degree by varying the positions of D and C, and of the tracer on E. If egg-shapes are required, take out the screw *d*, and slide the tube F anywhere to the left on the bar A, and fix it there by the screw *k*;

then put the screw *d* through the groove in the bar E (instead of through the hole on its end as before,) and into the tapped end of M again.

The figures now traced by the pencil will be egg-shapes, whose major and minor axes, and the relative proportions of their broad and narrow ends may be varied in any degree by varying the positions of D and C, of the tracer on E, and of the tube F on the bar A.

G is the tracer holder (shown separately in fig. 2; a detached view of the cylindrical piece D is also given in fig. 3.). L is a screw for raising the bar A off the paper to allow the tube F to slide freely on A. The horizontal length from the angle *h*, to the centre of the rivet *v*, must be equal to the length of M between the centre of the screw *d*, and the axis of the bar A.

DR. NORMANDY'S SOAP PROCESS.

Sir,—My attention having been called to a paragraph concerning a patent of mine, published in your Magazine of the 30th ultimo, page 343, signed "A Shaver," I have perused it carefully. Coming, however, as it does, from one who avows that "he is not much of a chemist, and certainly never was a manufacturer of soap," I might have allowed it to pass unnoticed, were it not probable that by so doing the public, who read your Magazine, might be prejudiced against my plan, and assume that this "Shaver's" opinion and statements are correct, because they had not been contradicted.

The conclusion which the "Shaver" arrives at,—namely, "that it does not require a great deal of chemical knowledge or of manufacturing practice to see that these alleged improvements are altogether fallacious," betrays at once a presumption and an injustice which might well lead me to impute sinister intentions to the writer; I am, however, willing to believe that ignorance alone may be the cause.

If "A Shaver" had tried the only fair test left open to him, lacking both chemical and practical knowledge, and used the soap, methinks he would not have been so ready to condemn it. For his information, however, allow me to say, that both chemically and physically my method is a decided improvement upon the ordinary plan, not a "useless addition," as he is pleased to call it; and I have yet to learn that a mode of making a better article from cheaper materials is a fraud. If (even at the same price as others) I offer the public a better soap, that is, a soap possessing greater durability in water, increased cleansing properties, a soap that will retain its full weight, instead of losing ten or twelve per cent., as all other soaps do by keeping, it seems to me that I confer a benefit, not practise a fraud.

I could easily prove, chemically, that the union of the salts of soda and of potash with soap, as described in my process, gives it a great advantage over other soaps, and answers a purpose of saving and economy both to the manufacturer and to the purchaser, to an amount not to be attained by any other means at present known; but as "a Shaver in *business*" (that is, I presume, a barber) knows little of chemistry, and nothing of soap-making, let him try it on his customers' chins; or if, deficient also in shaving skill, they, knowing it, will not permit him, let him perform the experiment on his own, and then he may, perhaps, favour us with an account of the result.

In the mean time I remain, Sir,
Yours very respectfuly,
A. L. M. DE NORMANDY, M.D.

Soap Factory, 11, Gloucester-terrace,
New Road, Whitechapel, May 12, 1842.

ABOLITION OF THE CLIMBING-BOY SYSTEM—HINTS ON CLEANING CHIMNEYS BY MACHINERY.

Sir,—As the new Act respecting the sweeping of chimneys will so shortly be in operation, it is time that all persons turn their attention to making such new arrangements in their flues, where it may be required, as will enable them to be cleaned by machinery.

In considering this subject, it has occurred to me that a new mode of cleaning chimneys might be adopted, that would prevent the necessity of any alterations; but I speak with diffidence on an untried subject: I will, however, venture to throw out the hint in your valuable Journal; and in time, perhaps, it may be ripened into use.

Most flues have from a square foot to a foot and a half of area in their cross

section; and if 60 feet high, will contain a body of air of from 60 to 90 cubical feet. I propose, by a very well known process, to give this body of air, from below, the velocity of our greatest tempests, which are found sometimes competent to remove the chimney, much more the soot.

Air, at 100 feet per second, exercises a force of 25lbs. on the square foot; and would, therefore, if not found sufficient to clear away soot alone, readily force such elastic whalebone brushes, or other matters, through the flue as may be found necessary to loosen it from the bricks, when it will be blown out.

It would be a nuisance to blow the soot out of the top of a chimney in towns; hence, in this case, the top of the chimney should be fitted with a large bag reservoir, that will contain more cubic feet of air than the chimney, and the blast must be stopped when this is filled. The soot must be left to settle for a few seconds; the air let out at a flap valve, like that of an organ bellows, and the operation repeated as often as required. A spherical bag, ten feet in diameter, will contain above 500 square feet.

A sort of parasol, made of strong canvass and cane, may be used for driving the brushes; and these may have a few light wooden wheels to guide them where flues bend much.

A man can exert the ordinary force of two horses for a few seconds; and by so constructing the ordinary centrifugal bellows that several men can apply their strength readily to it, it appears that the velocity of 100 feet per second can be commanded by multiplying wheels in the usual way.

It will be necessary to have the front openings to the chimney well secured by an expanding frame and strong air-tight cloth, and also any others that communicate with it.

I am, Sir, yours, &c.
G. C.

THE PARIS RAILWAY ACCIDENT—MORE VICTIMS TO MISMANAGEMENT.

The Paris and Versailles Railway has been the scene of one of the most tragical disasters which has yet occurred in the history of railways. Two *four-wheeled* engines were drawing, at a great velocity, a train of eighteen passenger carriages—the axletree of the first broke, and down it fell—the second ran over the first and crushed it to pieces—the second was in its turn run over by three of the carriages immediately behind it, each rising over the other—and in an instant engines, drivers, carriages, passengers, were all mingled together in one horrid heap of destruction. An instant more, and the heap was on fire from the burning coals scattered by the engine furnaces! Of those who escaped immediate death, all who were so maimed as to be unable to move, only survived for a few minutes to perish more awfully by the flames. And still more sad to say, there were in all probability not a few left, with limbs unbroken, and with strength sufficient (if strength would have sufficed) to save themselves, but who were prevented from escaping by the practice of making fast the doors of railway carriages—literally tied to the stake, in fact, and burnt there to ashes, martyrs at once to railway mismanagement and railway discipline.

The number of the sufferers by this awful calamity has not yet been accurately ascertained. According to some estimates not fewer than one hundred persons were killed, and some sixty or seventy wounded, (including those in the carriages in the rear who suffered from the severe shock given to the entire train); according to others the loss of life was considerably less—according to all it was enormous.

The Academy of Sciences immediately held a meeting to enquire into the accident, when a Report upon it was read by MM. Combes and Senarmont, engineers, which assigns it to the following causes:

"The accident is due to a fatal concurrence of circumstances, *which are all so many gross faults, easy to have been foreseen, and still more easy to have been avoided*, so that the future prosperity of railroad companies is by no means compromised by this sad affair.

"The *first* cause of the accident was the employment of a locomotive with *four wheels*. It is essential that every carriage intended for service on a railroad, should rest on six wheels at least, in order that if one of the axles should break, the carriage

should still rest on supporters, and continue its course.

"The *second* fault consists in the employment of two locomotives for a single train. The consequences of this arrangement are self-evident.

"A *third* circumstance is the precaution taken to lock the doors of the wagons, so that in such a case as that which occurred all escape was prevented, and the travellers were condemned to suffer all the consequences of the first accident.

"A *fourth* cause which had much influence on the catastrophe, was the neglect to isolate the train from the locomotive, so as to prevent the shock occasioned by the sudden check to the speed with which they were proceeding.

"It is worthy of remark, that if all those causes had not existed together, and if only a single precaution had been taken, the accident would not have happened. If the first engine had been furnished with six wheels when its axle broke, it would not have lost its equilibrium. If a second locomotive had not been employed, the only consequence of the accident would have been a shock; and even admitting that the two first causes of the accident existed, had the doors of the wagons not been locked, a number of the passengers might have escaped the flames. In fine, the interposition of the buffer system would have saved the train, even if no other precaution had been observed."

It will be in the recollection of the readers of our journal, that the danger to be apprehended from each of these causes, with the exception of the third, has been repeatedly pointed out in its pages, (as well as in those of several of our English contemporaries;) so that it is not merely *want of foresight*, as the authors of this Report represent, which we have on the present occasion to lament, but a culpable persistance in practices which the voice of science has long since condemned. The French engineers, it is true, have still the authority of English example to plead in extenuation, for the same practices which have led to this disaster on the Paris and Versailles Railway, prevail on some of the most important of our own railways; but there is also much good English example to the contrary—on the four wheel point, at least, if not on others. It would be well, however, for humanity, if the engineers of both countries would heed example or fashion less, and take counsel of common sense and experience more. No authority, however long standing or eminent, can excuse adherence to such palpable blunders in mechanical construction and disposition, as the preference of four wheels to six; the employment of two engines to draw one train, and the attaching of the passenger carriages immediately to the engines, without any buffing apparatus or other means of protection between. (We say nothing at present of the locking of the doors, for that is a point on which there is much, we apprehend, to be said on both sides.) Neither ought any past exemption from accident—even though it were twice as great as the managers of our London and Birmingham line boast of as *their* excuse for doing nothing—to be urged as a reason for delaying one hour the rectification of these blunders. The accident which has just filled all Paris with consternation and sorrow, *may be repeated on some of our own lines to-morrow*. There is nothing whatever in their arrangements to prevent it; nothing to make breaking of axles, and engines running foul of one another, and upsetting of fire-boxes, less likely to happen, or happening, less likely to produce extensively fatal consequences, on the one side of the Channel than on the other.

We should not wonder, if notwithstanding all that has passed and all that has been said, the adoption of a more improved system of railway transit were still to have considerable opposition to encounter—at the hands especially of those who have set themselves up as the pen and ink champions of things as they are (for what so obstinate as the vanity of a little learning?)—but we shall wonder greatly if the good sense of society bear much longer with the apathy of railway proprietors, or the empty babble of their apologists.* It is high time

* The most inveterate scribbler of them all is a pestilent ironmonger, who on the same principle that the poker and tongs may be supposed to know something of the chemical principles of combustion, because their station is near the fire-place, ima-

to be done with prating about the safety of existing practices, when people are smashed to death by them in scores and hundreds.

We conclude by earnestly inviting the attention of our readers to the very sensible and impressive letter which follows, on the subject, from Sir George Cayley, to whom the public are already indebted for a very able *Essay on the prevention of Railway Accidents*, as well as many valuable practical suggestions for the purpose, and whose opinions have the recommendation of being not only those of a gentleman of well deserved eminence in the scientific world, but of one whose rank in society gives assurance of their being promulgated solely with a view to the public good.

ON THE LATE ACCIDENT ON THE PARIS AND VERSAILLES RAILWAY.—BY SIR GEORGE CAYLEY, BART.

SIR,—It is obvious that if some more efficient precautions respecting railway conveyance than those at present in use be not adopted, we shall be subject occasionally to such sweeping and horrible catastrophes as have occurred near Paris, in which, at one fell swoop, from 80 to 100 persons have been killed under circumstances too shocking to dwell upon; for of those who witnessed the miserable reality, several have been deprived of reason. But although we may choose to avoid allowing our imaginations to particularize these horrors; yet it will not permit us to draw a veil over the broad fact that when we travel per railway, we place ourselves within the range of a similar result. This state of things has a twofold evil attending it; nervous and timid persons are absolutely prevented from using this mode of conveyance; and the great mass who venture upon it, travel under a painful sense of the danger they incur. It is impossible perfectly to exclude all risk from this or any other mode of conveyance; but it is equally absurd and wicked not to have the most rational means of preventing these accidents enforced upon the railway companies by law. Other modes of conveyance are nearly put down, and very soon none of her Majesty's liege subjects will be left any choice in their means of conveyance; and the question is, whether their lives are to be thus continued in jeopardy (when ready means are at hand to prevent it, or at least to reduce it within the ordinary chances of life and limb,) or that companies monopolizing the means of conveyance, are to be put to a reasonable expense in being compelled to adopt such means, as will prevent nine-tenths or ninety-nine-hundredths of these horrors? If Government be not permitted to interfere with private property, vested in these companies, for the purpose of protecting life, and that property is thus made to outweigh the value of life, it is full time that this noble invention should be taken entirely into the hands of the Government, and thus ripened into safety, clear from the mammon of money-making. To avoid expense, the companies are obliged to fence themselves round with every barrier to prevent the introduction of those improvements, which experience or invention has suggested; but it is in vain for these parties seriously to pretend that *all* these matters are visionary schemes and below their practical notice, though very possibly *many* may be so. I will put the case thus. It has been suggested over and over again, by many persons, and in various ways, that besides the usual buffers to each carriage, some general system of elastic matters should to a great extent intervene between the head of the train and any obstacle it may meet to stop its course; nothing can, to common practical sense, be more obvious than this; yet nothing has been done by railroad companies respecting such an arrangement which, in fact, would cure nine-tenths of the head and front of the offending.

However, this would not alone meet every case; let us take, for instance, that which has just occurred near Paris. Had some general system of buffers intervened between the engines and the head of the train of waggons, the accident would, it is

gines that he must know better than any body else how railways and railway carriages should be constructed, because his daily business is with iron bars, hoops, and faggots. It was this mischievous busy-body who either moved or seconded (we forget which) the memorable resolution of the Birmingham Railway Conference, (the *Masters'* Conference, we mean,) that none of the accidents which have occurred on railways, were in the slightest degree imputable to want of judgment or care on the part of Railway Directors! One of this gentleman's most recent exhibitions of ignorance was amusing. Not knowing the difference between *ascension* and *secension*, he mistook the one for the other, and wasted a ream of good *foolscap* in proving that a bubble of gas may mount into the air without being *set fire to. If Master Shallow do not shift his quarters soon, the Thames will be in danger.*

true, have been prevented; and the French suggest that, to answer this purpose in future, the first five or six wagons should remain empty to be ready for *smashing*, and to save those loaded in the rear. This is but a rude mode of effecting the purpose, but it points out the public opinion as to the general buffing principle, and ought to teach a lesson to railway directors. Had these general buffers, however, preceded the engines, they would not in this case have been efficient, as the broken axletree of the leading engine would still have upset the train. But had the engine been provided with six wheels, or been so constructed as to rest on a foot or sledge made to sustain the carriage on the rail, when any wheel may fail, as has long ago been suggested, then the catastrophe would have been prevented. These sledge feet accompanying every wheel, and suspended an inch above the rail, until the wheel breaks, ought to be a *sine quâ non* in all railway carriages; the cost would be trifling and the safety great.

It has also been suggested that there is no necessity for the train to take the same risk as the official parties working the engines, on whose conduct the safety mainly depends, and from whose neglect most accidents occur. The engine will pull the train with equal effect when a cord of from 50 to 150 yards intervenes; and this might be lengthened or shortened at pleasure to suit curvatures on the line by coiling it round a drum. Suppose a train of carriages to be so constructed that each carriage is furnished with a drag on its wheel, which is always in action, excepting when the tension of the cord from the engine becomes sufficient to give motion to the train, and lift the drags; in this case, so long as the engine continues on its course, it pulls the train freely after it without any friction from the drags; but, the instant the engine becomes stopped or upset, the drags are all at work, and the train is brought to rest in a few yards without overtaking the engine or any risk of accident. Some minor arrangements will be necessary in this mode of drawing trains; but the general features of the case are obvious enough, and may readily be brought into use.

It is not my object to go further into *these matters* at present than may be *sufficient to point* out how obviously com-*mon sense is* at variance with railroad practice; and how essential it is that the former, pleading for life and limb, *versus* money and monopoly, should prevail. I do not blame the directors of railroad companies; they are placed in authority by parties subscribing their money with no other view but to make the most interest they can of it, and with their delegated authority, they could not appropriate any part of their funds to the mere charitable purpose of saving life. But this places them in a painful and false position as respects society at large, now that railroad conveyance has become the order of the day. Safety, it may be said, is ensured by its being one element in gaining passengers, but increasing monopoly of conveyance, leaves no choice, and whatever be the hazard, we must either rest stationary or take it; hence, the same profits arise to the companies whether they improve upon the means of safety or not.

Many excellent plans for signals have been invented, and want little to perfect them into the means of almost ensuring safety, from collision with trains or other obstacles. One especially, first suggested by Mr. Curtis, which ensures either one mile in advance of each signal post being totally free from obstacles—or if not free, erects the signal for danger night and day in immediate view of the approaching train.

These matters I have named, either *can*, or *cannot* be done; if they can, great safety will be the result; and I think the public has a right to know from first-rate engineering authority, clear from all interested parties, and by the test of experiment, under such authority, whether these or any better means can be applied to prevent the death's head and cross bones becoming the appropriate crest for railway carriages.

I am, Sir, your obedient servant,

George Cayley.

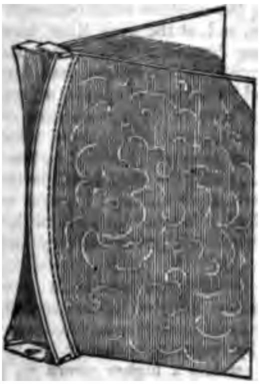
Brompton, May 13, 1842.

TYLER'S SPRING LEAF-HOLDER.

(Registered pursuant to Act of Parliament.)

Sir,—The readers of your Magazine, as of many other periodicals, have the choice of two evils, viz. either to wait till the end of the month for the numbers neatly stitched up into a *Part*, or to suffer an accumulation of loose leaves, liable to be soiled or lost, and inconvenient for reference.

Both these states of things have been found so annoying as to lead to several attempts to remedy the evil, by the construction of *leaf-holders* of various kinds, one of which, at least, has been made the subject of a patent. Each of these contrivances has in use been found defective, some failing from one cause, some from another. A very simple leaf-holder has recently been introduced by Mr. Tyler of Sheffield,* which obviates most, if not all the faults of its predecessors. The accompanying sketch will illustrate the



nature of this contrivance, which consists of two curved steel springs enclosed in the leather part of two portfolios, or book covers; at the top and bottom of each spring is jointed a metal link-plate or clasp, by which the back may be adjusted to several thicknesses, as the quantity of its contents increases. The curved form of the springs causes the numbers, etc., placed between to be held very tightly, the greatest pressure beginning at the centre; and so perfect is the holding, that a single Bank note is held so tightly, as to make it impossible to withdraw it until the clasps are released.

In using this holder, the numbers or leaves are to be laid evenly upon one of the covers: the other cover is then placed over them, and the right-hand clasp hooked: the other end of the spring is then to be pressed down, and the other clasp fastened. The back of the volume thus formed being struck flat on the table, will bring all the backs of the numbers even.

Some persons have objected to the trouble attending the operation of inserting a number; but I suspect this objection only arises with individuals who are too idle in their habits even to collect their numbers together. "There are no gains without some small pains," is a trite proverb, and if people are too lazy to take any pains to keep their odd numbers in a compact and convenient form, they must be content to devote some of their gains to supply the deficiencies which are discovered in their volumes by the binder.

Mr. Tyler's simple, effectual, and durable leaf-holder, is admirably adapted for its intended purpose, and I have great pleasure in bearing testimony to the convenience which I have experienced from the use of several of them of various sizes.

Remaining, Sir,
Yours, respectfully,
WM. BADDELEY.

29, Alfred Street, Islington,
April 27th, 1842.

* *Riddell and Meymott, London, Agents.*

THE ALLEGED ADULTERATION OF ZINK.*

Office of the London Zink Works, 28, Martin's Lane, Cannon-street, May 12, 1842.

Sir,—In the *Mechanics' Magazine* of the 7th instant, No. 978, there is a communication from Mr. Mallet on the subject of zink, which I, as one largely engaged in the trade, feel compelled to answer, by saying, that as far as concerns the sheet zink, rolled at the London Zink Mills, not one particle of lead or any other metal is, or ever has been, mixed with the spelter there used. The crude metal is remelted and freed from

* We adopt the spelling of our present correspondent, Mr. Ball, which is the correct one. "The common orthography *zinc* is erroneous," *Webster's Johnson.* The word is borrowed from the German, in which it is spelt *zink*. The change into zinc is of French origin, and was owing, doubtless, to the natural dislike of our Gallic neighbours to the letter k, which, though used in kilogramme, kilometre, &c., is still only a sort of naturalized alien amongst them. So far as regards the noun substantive, the substitution of the c for k is of no consequence, and it is only when we begin to form other words from it, that the impropriety of departing from the original orthography is felt. *Zinced*, pronounced with the c soft, would be an intolerable offence against euphony, and therefore, we say *zincked*. The French get over the difficulty by having recourse to the barbarism *zingué*, which shows that they do not manage every thing better in France. Better to adhere to the original spelling all through, zink—to zink, zinked, zinkography, *zinkographer*, &c. ED. M. M.]

oxide and other impurities at no inconsiderable expense and loss, but nothing is ever added.

All the spelter received from the Continent contains lead or iron, and often both. On the average, however, I believe the proportion falls short of, rather than exceeds, one per cent. in all. Of the Belgian spelter I have had little experience, but I do not imagine it differs materially from the other kinds. Now that your above-mentioned correspondent should have met with any sheet zink containing from 20 to 33 per cent. of lead does seem to me most extraordinary! and as an adulteration of this sort is clearly a fraud, and must be mischievous, I hope Mr. Mallet will prosecute his inquiries, and withdraw his statement if further research lead him to a conviction that it is erroneous, or, in the contrary case, again warn the public against the vendors of such spurious merchandise.

I remain, Sir, your obedient servant,

JOHN BALL.

BUDDING'S GRASS-MOWING MACHINE IMPROVED.

In our 17th vol. p. 345, we gave an engraving and description of the Grass-mowing Machine in use at the Zoological Gardens, invented and patented by Mr. Budding. It has, we find, been since much improved upon by a Mr. Shanks, of Arbroath, at the suggestion, and under the direction of W. F. Lindsay Carnegie, Esq., of Kimblethmont, one of the most zealous and intelligent patrons of all new inventions and improvements, of whom Scotland can boast. The chief defect in the original machine was, that it was applicable to the shearing of small spaces only; the great merit of the improved machine is, that it will cut with facility pleasure grounds of any dimensions. We extract the following account of it from a communication by Mr. Carnegie to our popular and useful contemporary, the "Gardener's Chronicle."

"The accidental discovery that the patent had been taken for England only, led to my employing a very ingenious mechanic in my neighbourhood (Mr. Shanks, of Arbroath) to construct the implement I first used. His success was complete, and I have had the experience of a whole season to test it. *My lawn* (consisting of nearly 2½ acres) *was cut weekly*, all last year, by one man, *aided by a small* pony, in a style not to be surpassed, if equalled, by the best scythesman. The breadth commanded was 27 in., and about eight hours were expended in going over the whole. Two men could draw the machine easily; but finding the horse's feet, when working, (as answers best in dry weather,) left no permanent mark on the grass, I preferred the latter: it is guided by leading-reins. During the season no repairs of any kind were required; and I do not think that even sharpening will be necessary until after several years' repetition of similar work.

"This success suggested a further improvement with a view to economy, viz. the giving the machine weight enough to act as a roller, and, at the same time, increasing the cutting breadth. The new machine, which commands 42 inches, has been just tested, and its success surpasses my expectation. The lawn of 2½ acres is now cut, the grass swept up, and the ground effectually rolled by my gardener, assisted by the pony, in 2½ hours; and the execution, particularly where there is a good sward, leaves nothing to be desired. When the ground is much fogged, a surface is produced very similar to velvet.

"Mr. Shanks has added a revolving brush, for the purpose of better delivering into the cutters the grasses, which are found occasionally reclining horizontally: it works well, and enables a higher sward to be removed at one operation; but these cases are, or ought to be, of unfrequent occurrence: this apparatus is easily detached. The economy effected may be easily estimated by any one; I shall not, therefore, go into the detail of its calculation: it is simply the whole expense in labour of scything, minus the difference in interest of capital invested in the machine, and in rollers, scythes, rakes, &c. I paid 18*l*. for the first machine; and I understand the cost of the new one (were there several to be made) would not much exceed 20*l*.; but for this I must refer parties to Mr. Shanks himself, who, in the present extraordinarily depressed state of the machine-making business, will, I doubt not, be but too happy to attend to any orders he may be favoured with. Looking to the accuracy of the execution, the weight of material, &c., I consider the price as lower than it could be done for in times of even ordinary prosperity. I ought to mention, that application may also be made to Mr. Ferraber, of Stroud, Gloucestershire, the agent for Mr. Budding, and an extensive maker of machinery. He came down here last year, and made himself acquainted with the details of the machine, and has, I believe, arranged with Mr. Shanks as regards the English patent."

NEW ARRANGEMENT FOR ELECTRO-MAGNETIC ENGINES.

Fig. 1.

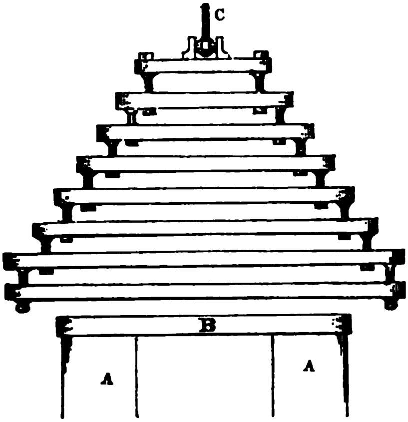
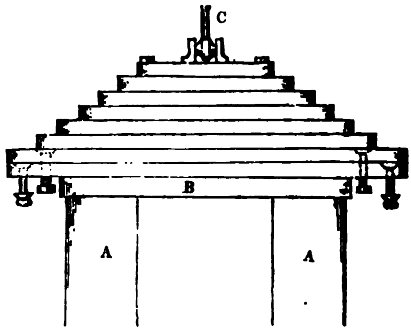


Fig. 2.



Sir,—Some time since I forwarded to you (signed with the initials W. H.,) a communication descriptive of a new arrangement for electro-magnetic engines, which you were so kind as to insert in No. 947 of your valuable journal. I have again to trespass upon your favour in order to notice some improvements which I have since effected in that arrangement.

The first is the substitution of the staple form of magnet for the straight bar. And the second consequent on the first, viz., breaking the circuit at the end of the stroke.

These alterations I have made in order to introduce the third improvement, which is, I believe, original, and of some importance, inasmuch as it may be applied to any electro-magnetic apparatus in which it may be necessary for the magnet to attract from a distance. By means of it any length of stroke may be obtained, and the power be more nearly equalized throughout the stroke.

The contrivance is shown in the accompanying diagrams, which represent the apparatus, which is introduced between the poles of the voltaic magnet and the crank. Fig. 1 shows it at its greatest extension at the beginning of the stroke. A A are the poles of the magnet connected by means of a keeper B of soft iron. The frame consists of soft iron bars, of which any number are so arranged, that the frame is capable of collapsing, as in fig. 2, at the end of the stroke. These bars may be placed at any distance from each other, but the closer, the more power is exerted. On commencing the stroke the battery circuit around the electro-magnet being completed, the first bar will be attracted, pulling with it the whole frame; when in contact with the keeper it becomes a magnet itself by induction, and attracts the second bar, which in like manner pulls with it the frame and the rest of the bars, which each in its turn is attracted till the stroke is finished, and the crank (the rod in connexion with which is shown at C,) has described half a revolution. The voltaic circuit is now broken by any convenient means in connexion with the engine, and the frame and bars are free to be drawn back to their original position, either by means of the momentum of the fly-wheel, or by means of the action of another reciprocating force exerting its power at the moment when the first ceases. The frame should be mounted on guides, but these are not shown in the figures to avoid confusion.

Yours, &c.,

W. Hislop, jun.,

St. John-street Road, May 14, 1842.

MR. LOUDON'S ENCYCLOPÆDIA OF COTTAGE, FARM, AND VILLA ARCHITECTURE AND FURNITURE—FIRST ADDITIONAL SUPPLEMENT.*

Mr. Loudon has set an example in the publication of this Supplement which we should be glad to see more generally followed by the authors of books of reference. Instead of making the progress of improvement since the appearance of the original edition of the principal work the pretext for a second, which should render the first wholly valueless in the hands of its possessors (considered in regard to its money worth), he has thrown all the additions and amendments which have accumulated on his hands, into a Supplement, with the paragraphs and pages so numbered as to be in exact continuation of those of the body of the work. People can thus obtain all that is new without having to pay (as they are too often obliged to do,) twice over for what is old.

Great and extensive practical utility is the striking feature of this Supplement, as it is of the Encyclopædia, to which it is an appendage, and indeed of everything proceeding from Mr. Loudon's pen. The new matter it contains is arranged under the following heads:—1. Cottages for Labourers and Mechanics; 2. Cottage Villas, and Villas; 3. Farmeries; 4. Schools, Public Houses, Union Workhouses, and Almshouses; 5. Construction, and Materials; 6. Fittings up, Finishing, and Furniture; and 7. Hints to Proprietors desirous of improving their Labourers' Cottages.

The most valuable novelty in this supplementary collection, is a description with working plans of the house of Sir John Robinson, the learned and accomplished Secretary of the Royal Society of Edinburgh. It is universally allowed to be in every respect: propriety and convenience of arrangement, commodiousness, elegance, comfort, the most perfect private residence in Edinburgh and has, we suspect, few rivals anywhere. "It presents," says Mr. Loudon, "the most perfect application of the system of heating [illegible] the houses of the inventor, W. Strutt, Esq., and his friends in the neighbourhood of Derby." It is lighted, too, with gas in every part, without the slightest injury to gaily painted walls and ceilings, or inconvenience of any sort whatever attending it. The joiner's work, painting and papering, furniture, ironmongery—every thing, in short, is described, and we believe with truth, as exhibiting each in its department, the perfection of modern art. Every person engaged in the building or fitting up of public dwellings ought, for the sake of this article alone, to purchase both Encyclopædia and Supplement forthwith (we say *both*, for though the Supplement only, contains the working plans, there are repeated references for parts of the details, to descriptions which had previously appeared in the Encyclopædia itself.)

In treating of Schools and Union Workhouses, Mr. Loudon states a remarkable fact, which serves at once to account for the heaps of architectural rubbish under these titles with which the face of the country has of late years been disfigured.

"The designs for schools published in the *Minutes of the Committee of Education*, being all by the same architect, and that architect also the author of the numerous designs for union workhouses, published in the *Reports of the Poor Law Commissioners*, there is a degree of sameness of style in both schools and workhouses, and of meanness in the elevations given for the schools, that, in point of taste, is quite intolerable. This is a subject which, in our opinion, deserves the notice of the legislature, or of public bodies. [illegible]

A [illegible] Mr. Loudon, [illegible] Supplement, [illegible]

* [illegible]

February 15.

"n *Historical Account of Copper Sheathing for Vessels.*" *By J. J. Wilkinson.*

ormer papers, by the same author, of Wood and Lead Sheathing for he present communication gives in duction a general account of Copper il; the localities supplying it; the which it has been applied, from the period to the present time; and the estimation in which copper of varitries is held on account of its deurity, its ductility, or its better pre-, in which latter particular British s stated to be pre-eminent.

itome is then given of a return to e of Commons; whence it appears 1839, into Swansea alone, there was l 4350 cwts. of unwrought metal, ,604 cwts. of ore, and that there orted during the same year of Bril, 153,742 cwts., and foreign metal cwts. Copper from Sweden is d more malleable than that from ; but the former is not so good as netal, as it contains a portion of

s extracts are made from "Knowles's rchitecture," whence is quoted the rded use of copper sheathing upon s frigate, in 1761; at that period, lieved that sea water had little acn pure copper, and the rapid decay rtial sheathing of certain ships was d to the impurity of the metal. Exshowed, however, that pure copper, employed on the *Tartar*, could be l in the short space of four years, e sheathing of the *Batavia*, an old man-of-war, and of the *Plymouth* as perfect after 24 and 27 years' in both the latter there was an $\frac{1}{100}$ part of zinc.

information was given on the rollopper sheets; the dimensions, the er square foot of different gauges, uses to which the various kinds are as also on the quantities of metal sheathing. The *Neptune*, of 120 s cased with 4738 sheets, weighing r 17 tons 19 cwt.

e of copper sheathing is to protect from destruction by the worm, and it the adhesion of weeds, barnacles, ch impede the sailing of the vessel. irst introduction of copper, it was conjunction with iron bolts, and tenings; these soon oxydated, and ccidents occurred. It was advised quence that all the bolts should be r or mixed metal. The attention of ent was directed to this subject, and Sir Humphrey Davy was appointed to experiment upon specimens of metal of different qualities. He soon discovered that when two dissimilar metals are in contact and immersed in sea-water, a voltaic effect is produced which occasions a rapid corrosion of the more oxydable metal, while the other remains uninjured. In 1824 Sir Humphrey Davy communicated to the Government that he had discovered a means of preventing the corrosion of the copper by rendering it electro-negative. This he proposed to effect by protectors of zinc, iron, or any other easily oxydable metal; after a variety of experiments he determined that the protectors should consist of six bars of cast-iron, whose united surface should be $\frac{1}{250}$th part of the area of the copper exposed to the action of the sea-water: two of them were placed midships on the keel of the ship, two on the bows, and two on the stern, about three feet under water. As far as the philosophical fact was concerned, the result was conclusive, as the copper suffered no waste.

Inconveniences, however, arose, which had not been foreseen: as the copper did not oxydate, its whole surface was speedily covered with barnacles and sea weeds, which collected in such quantities as to impede the sailing of the vessels, and adhered so fast that in removing them the copper was frequently torn away: the protectors were therefore abandoned, in 1826, for all vessels on service, but were still used for the ships lying up in harbour; the bottoms of these became, however, so foul, that, in 1828, the system was entirely abandoned.

After the protectors had been for some months on the ships' bottoms, it was found that on the outer surface a red oxyde was formed, and beneath it, for some depth, a substance resembling plumbago; this substance, having sulphate of iron for one of its constituents, when laid upon any inflammable body, caused spontaneous combustion: a similar result was obtained by Mr. F. Daniel in 1817, while experimenting upon cast-iron, by solution in dilute muriatic acid.

Protectors of various kinds have been tried in the French navy, and in the United States; but generally with doubtful success.

A list of all the patents for copper and other sheathing, as well as for means of preventing corrosion, &c., is then given at great length: the gradual progress of the application of copper sheathing, first to ships of the Royal Navy, then to Indiamen, to Transports, and finally, to Merchant Ships, is then traced. It appears that of the vessels which

enter the Thames, one-fifth are sheathed with copper and its alloys; of vessels at Liverpool, eight-tenths are coppered. The precautions for preserving uncoppered vessels from the "Teredo navalis" are then described: and coal-tar pitch is mentioned as the most effective substitute for sheathing.

Copper sheathing appears to be entirely neglected for vessels in the coal trade, although it is singular that the "Teredo" is found in every port to which coals are carried, south of the Tees; in the Thames, as high up as Gravesend, and northward as far as Whitby; traces of the ravages of the "Teredo navalis," and of the "Limnoria terebrans," have at various periods been found, from the north of Scotland and Ireland, on almost every coast to the Cape of Good Hope and Van Diemen's Land in the Eastern Hemisphere; and in the Western hemisphere, from the river St. Lawrence to Staten Island near the Terra del Fuego, almost in the Polar Sea; so that although this maritime scourge is rifest in warm climates, yet cold latitudes are not exempt from it.

Mr. Lowe was pleased to find that the use of coal-tar pitch for shipping was advantageously mentioned: he was convinced that it would be found very superior to vegetable pitch: he had seen comparative experiments tried on board an India ship, and the result was, that the timber which had been coated with the former was preserved both from the worm and from decay, while that which was covered with the latter had suffered from both. He attributed the preservative quality of the coal-tar pitch to the quantity of sulpho-cyanic, or sulpho-prussic acid, which it contained.

Mr. Horne had used coal-tar extensively on wood, but found that it produced decay, which he attributed to the ammonia contained in it.

Lieutenant Oldfield alluded to Renwick's Patent, for saturating timber with coal-oil: he had seen specimens of piles at New York, which, when prepared by Renwick's process, perfectly resisted the attacks of the "Teredo navalis," in the same situations where "kyanized piles" had been entirely destroyed.

Mr. Bethell confirmed Lieutenant Oldfield's statement. Coal-oil was a powerful preservative when properly prepared and applied:—he objected to the use of ammonia in any shape, as it rotted timber very fast. In experiments he had made, previously to taking out his patent for preparing timber with coal-oil, he observed that wood coated with common coal-tar soon turned brown, and decay ensued; ammonia produced the same appearance and effect. If any vegetable fibrous substance, such as peat, was sprinkled with ammonia, it speedily rotted and became a rich black earth. In the Mediterranean, the native ship-owners used nothing but coal-tar pitch for their vessels: they were cleaned and well tarred twice a-year, and the worm seldom made any ravages, although unprepared timber in those latitudes was destroyed in a very short time.

The refined coal-tar, as manufactured in London, is purified from ammonia by distillation, and found an excellent coating for wood. The oil of tar, used in Mr. Bethell's process, is likewise purified from ammonia.

Mr. Parkes conceived that diluted ammonia must be meant as recommended for agricultural purposes, and not the ammoniacal liquor as it came from the gas-works; the former, when used with discretion, properly diluted, and to certain soils, was an active stimulant in cultivation, but the latter contained matter which was very prejudicial.

Mr. Bethell observed that ammoniacal liquor, when diluted with three parts of water, had been found to succeed perfectly with peaty soils. Nearly all the sal ammoniac of commerce is now made from the ammoniacal liquor from gas-works.

Mr. Hawkins remarked, that it could be readily understood that the proportion of ammonia used would regulate the effect to be produced; as in the case of gypsum, of which two bushels per acre was a good manure; but in some places fifteen or twenty bushels per acre had been tried, and of course a complete failure had ensued.

Mr. Parkes replied, that gypsum was commonly used in Yorkshire, and habit had dictated the proportions so well that it seemed to be the best manure the farmers possessed there.

Mr. Taylor recalled the conversation to the subject of the paper on copper sheathing; from which many curious facts might be drawn. The ancient specimens of copper sheets had endured longer than the modern: the former contained an alloy of $\frac{1}{150}$th part of zinc. The "Muntz" metal, which is now being extensively used, contains alloy of the same material, but in a larger proportion. The inequality of manufactured copper had perplexed the chemist and the manufacturer for full forty years; and after all their researches and experiments, it would appear that the chemistry of the manufacture of copper and of iron was not understood. Mr. Taylor had been consulted by Sir John Henslowe on the subject, and he had recommended assaying the sheets instead of receiving them by the appearance of their surfaces as was the usual mode. Dr. Farady and Mr. Richard Phillips had made an extensive series of experiments for Mr. Vivian, and Mr. Farquhar had carefully analysed

specimens; but all these eminent men n discovering any chemical difference 1 the copper which had endured well .t which had been rapidly destroyed. ts of copper rolled the same day, under itly similar circumstances, differed ma- in quality. In the process of "poll- 'hich is carried on by stirring about per while in a fluid state with poles 1 wood, producing ebullition, whether eration is continued too long or too time, the metal becomes brittle and lity cannot be recovered.

copper is now exported from Russia the attention of the miners is direct- e gold mines. Mr. Taylor attributed eriority of the quality of the foreign to the ore being smelted with char- hereas English copper is smelted tuminous coal, frequently containing r.

March 8, 1842.

iption of the Tanks for Kyanizing Timber for the permanent Way of Hull and Selby Railway." By John erley.

1 the recommendation of Mess. Walker ges, the engineers, it was determined e sleepers of this railway should be d in close vessels, using exhaustion ssure, instead of in the open tanks employed. The present communi- which includes a description of the ig vessels, and an account of the va- rcumstances connected with the ope- commences by describing the appa- s shown by the accompanying draw- consist of two tanks, a reservoir, two imps, and a double air-pump. The e cylindrical, with flat ends, and are f wrought-iron plates, nearly half an thickness. They are 70 feet in length, et in diameter. At each extremity -iron door, flat on the outside, and on the inner side, provided with ba- eights for raising and lowering it. id is strengthened by five parallel n girders, whose extremities are held ight-iron straps, riveted on to the erence of the tanks. Notwithstand- great strength of these girders, seve- broken by the pressure applied dur- process. The vessels are lined with n which is laid a covering of close- ir battens, fastened with copper ri- This precaution is necessary to pre- mutual deterioration which would m the contact of the iron and corro- limate. There was originally only ass force pump, 2 inches dia- and 6 inches stroke. This being found insufficient, another was added of 4 inches diameter, and henceforward a pressure of 100 lbs. per square inch was easily obtained. The air-pump is 10 inches diameter, and 15 inches stroke. Its construction is of the ordinary kind. The author gives, in an appendix to the paper, a minute description of the various parts of the apparatus, with the details of their dimensions and weight. The process is simple and rapid: the corrosive sublimate is first mixed with warm water in a trough, in the proportion of 1 lb. of the former to 2 gallons of the latter; the clear solution is then poured off into the reservoir, where water is added till it is diluted to the proper point, which may be ascertained by a hydrometer. A more perfect test is the action of the solution upon silver, which it turns brown at the requisite degree of saturation. The operations of exhaustion and pressure employ eight men for five hours, the whole process occupying about seven hours, during which time from 17 to 20 loads are kyanized in each tank. It is desirable that the timber should remain stacked for two or three weeks after kyanizing before it is used. It was found that about ¾ lb. of corrosive sublimate sufficed to prepare one load (50 cubic feet) of timber. About 337,000 cubic feet of timber were kyanized, the average expense of which, including part of the first cost of the tanks, was about 5*d*. per cube foot. The timber was tested after the process, and it was found that the solution had penetrated to the heart of the logs.

The paper contains some interesting tables, exhibiting the quantity of solution taken up by different kinds of wood, with and without exhaustion. From these it appears that the saturation per cube foot, in the latter case, did not exceed 2·25 lbs. with specimens of Dantzic timber; whereas it ranged between 12·24 lbs. and 15·25 lbs. with pieces of home-grown wood. The author observes that this striking difference may be partly due to the greater compactness of the foreign timber.

Appended to this communication is a correspondence between Mr. J. G. Lynde and Mr. James Simpson relative to the best tests of the presence of corrosive sublimate, accompanied by letters from Mr. Colthurst and Dr. Reid. The former of these describes the process of kyanizing adopted on the Great Western Railway, and the latter suggests the three following tests: 1st, Dilute hydro-sulphuret of ammonia; 2nd, A strong solution of potassa; dilute nitric acid and proto-muriate of tin, also gold-leaf with this solution; and 3rd, Iodide of potassium. Directions are given for the application of these tests.

Mr. Lynde also mentions the use of a solution of nitric acid; and, by the application of hydriodate of potash detecting the presence of mercury in a specimen taken from the heart of a log of timber 10 inches by 5 inches and 9 feet long. He also details appearances of the destructive action of the corrosive sublimate upon the iron-work with which it came into contact, which would be prejudicial to the use of iron bolts in kyanized sleepers.

A drawing, explanatory of the whole apparatus, accompanied the communication.

In answer to questions relative to the process of exhausting the air from the receiver in which the bank-note paper was wetted at the Banks of England and Ireland previously to being printed, Mr. Oldham stated that as an experiment a packet of 1000 sheets of paper had remained a whole day in water without being wetted through; whereas, by exhausting the air from the vessel containing them, to a partial vacuum of 22 inches of the barometer, and admitting water, they had been perfectly saturated in five minutes. The edges of the paper, in simple immersion, would rot away before the mass was saturated: by the exhausting process 5000 sheets of bank-note paper would absorb 16 lbs. of water.

Mr. Simpson conceived that exhaustion would facilitate the process of kyanizing; but he believed that if time was allowed, pressure would accomplish the same end as perfectly; for he had observed that pieces of wood which had remained four or five days in a water-main, under pressure, had become perfectly saturated. Captain Scoresby, in his account of the whale-fishery, remarks that when a whale carries a boat down it rarely rises again, most probably because the fish plunges to such a depth that the extreme pressure waterlogs the boat. Instances had been known of the specific gravity of the planking being doubled by being carried down.

Mr. Newton remarked, that immersion of timber in close tanks had been practised by Mr. Langton many years since, for bending timber. A boiling fluid was used in the tanks, and the wood was subjected to heat for a considerable period. He had understood that Mr. Newmarch, of Cheltenham, was the first person who used corrosive sublimate for preserving timber, and that he had prepared and employed considerable quantities of wood. Mr. Kyan subsequently revived the system.

In Mr. Oldham's process of wetting paper pressure was not requisite, on account of its open texture. About the year 1819, Mr. Oldham had tried the same process with perfect success for preserving meat.

Exhaustion had been tried by Mr. Harris for cleansing wool. The cops of wool were put into an exhausted receiver; a solution of an alkali was then admitted. After remaining a short time in the liquid, a sufficient quantity of diluted acid was added to neutralize the alkali, and the wool was washed out in clean water. The process succeeded perfectly, but was too expensive.

Mr. Palmer had employed the kyanizing process for large pieces of timber, for the ribs of lock-gates, but had no means of ascertaining the depth to which the mercury had penetrated. The use of corrosive sublimate was first suggested by Sir H. Davy, in his lectures at the Royal Institution, as a means of destroying the vegetating process in timber, by the combination of the chlorine in the former with the albumen of the latter. Mr. Palmer much doubted whether the means used for exhausting the capillary tubes effected the object, unless the timber was in a dry state; and he considered it equally doubtful whether the solution could be forced to any considerable depth by compression, especially if any moisture actually filled the capillary tubes. The application of pressure in the process of salting meat, suggested by Mr. Perkins many years ago, was a complete failure.

Mr. Simpson observed, that in the experiments of Messrs. Donkin and Bramah, pressure alone had been used, and it could easily be understood that owing to the cellular formation of meat, the pressure, instead of forcing the salt through it, caused the substance to collapse, and the brine was prevented from penetrating.

Mr. Braithwaite explained that in Payne and Elmore's process, although pressure had been found indispensable, the meat was more perfectly prepared when exhaustion was also employed, therefore both were now combined.

Mr. May reverted to the subject of kyanizing timber; he believed that exhausting the air from the tanks previously to the admission of the solution was a loss of time—the fluid should be admitted first, or at least while the exhaustion was proceeding; labour and time would thus be saved, and the air would be more completely expelled from the capillary tubes before pressure was applied. It was essential that the timber should be as far as possible deprived of its sap as well as dried: as either sap or moisture appeared to prevent the proper action of the corrosive sublimate.

Mr. Cubitt regretted that experiments had not been made on the same kinds of wood, both with and without exhaustion. The experiments on small pieces of foreign (Memel and Dantzic) timber with 80 lbs. to

pressure without exhaustion, showed ase of weight of from 1½ to 2oz. in of about $\frac{1}{40}$th part the size of a and that result agreed very nearly practice with sleepers of Memel and timber, when kyanized without ex- under a pressure of 80lbs. to the leepers of 2¼ to 2¾ cube feet, gaining lbs. to 5lbs. in weight by the pro- No result had been given of experi- with sleepers of foreign fir timber in both exhaustion and pressure had pplied, but it appeared that the fir sleepers weighing 100lbs. when d under exhaustion and a pressure lbs. to the inch, gained 33 per cent. ht, which was equal to three gallons r being forced into less than 3 cube timber; he thought that this differ- uld not be all due to exhaustion, but must depend greatly upon the qua- the wood, because under a pressure bs. to the inch, the air contained in lar substance (such as fir timber) all be compressed into about ⅛th of ural bulk, without previous exhaus- o that the difference between 5lbs. lbs. forced into a sleeper, could not, ght, be all due to exhaustion, but epend upon other circumstances not ed in this paper.

President thought that the greater of absorption by the Scotch fir might unted for by its open texture, where- oreign timber was more compact, and ntained more turpentine. It might ve been wetter than the Scotch fir, he believed had been the case.

Taylor observed, that hitherto the n of the meeting had been entirely d to mechanical action, but that the al combination of the corrosive sub- with the albumen of the wood, was int most insisted upon by Kyan; it pposed to be similar to the operation ing hides, in which the tannin of the ombined with and saturated the ani- latin, which would not otherwise be ble by the fluid in which it was

t. Oldfield suggested that if the tim- en piled in the tank was subjected to ion of heat at 212°, the moisture con- in the capillary tubes would be ex- in the form of steam, and that on the ion of the solution, the tubes would ly be filled with it, because of the vacuum formed in them.

Colthurst observed, with regard to ts for ascertaining the amount of sa- n of the timber, that he had tried all escribed by Mr. Lynde, and had not ble to discover the presence of mercury in the heart of any of the timbers prepared for the Great Western Railway; their dimensions were 6 inches by 12 inches; Dr. Faraday had, he believed, detected it by the aid of the galvanic battery in the heart of a piece of timber 2 feet square, after simple immersion in the solution for fourteen days.

Mr. Moss had tried many experiments as to the most delicate tests for ascertaining the depth to which the mercury had penetrated; the most satisfactory test was gold leaf, as from its strong affinity for mercury, the presence of the latter was immediately detected. The mode of proceeding was to put some fibres of the wood to be tested into a small test tube, mixed with a portion of dry carbonate of soda; then, to place over, but not in contact with it, a small piece of gold leaf, and apply heat to the bottom of the tube. If any mercury was present, in however small a quantity, the fumes would rise and discolour the gold leaf.

Mr. W. Cubitt said, that timber was at all times, more or less, charged with moisture: he had found deals, supposed to be dry, lose 10 per cent. of their weight from steam drying; it was evident that the presence of moisture in the pores of the wood must militate against the success of kyanizing by simple immersion, unless it was continued for a very long period. In close tanks, when exhaustion and pressure were resorted to, the moisture was perhaps of less importance, but still, if the sap was extracted, and the timber previously dried, the process of kyanizing would be more efficient.

Mr. S. Seaward adopted Mr. Palmer's position, as to the almost impossibility of forcing the solution through the capillary tubes of a long piece of timber, the pressure being applied equally all over the surface: he believed the present method of kyanizing to be very imperfect, and alluded to a number of sleepers so prepared for the West India Dock warehouses having been recently discovered to be decayed.

Mr. Martin confirmed this account of the decay of the sleepers: fifty out of seventy were destroyed; they had been prepared by simple immersion, and had been down about five years. He had understood that some of the wooden tanks in which the solution was kept at the Anti-Dry-Rot Company's yard were decayed.

Mr. C. May believed that the destruction of the tanks might have arisen from the constant corrosive action of the mercury, and not from decay. The capillary vessels of timber being filled with air and sap, under exhaustion the air would expand and drive before it a considerable portion of the sap and moisture. In preparing the compressed trenails and wedges he used steam,

and found that the pores were opened by it—he suggested that steam should be blown through the tanks until all the timber in them was raised to a certain temperature, and then by opening the communication with the reservoir, the solution would rush in and fill up the vacuum.

Mr. Cowper believed that it was only necessary to bring the chlorine of the corrosive sublimate and the albumen of the timber into contact, when sufficiently dry, to insure the preservation of the wood. He had occasion to try experiments with paper pulp, and was constantly annoyed by its decaying—but the addition of a small quantity of chlorine had preserved it good for two years, and he believed that it would continue unchanged.

General Pasley confirmed the statement as to the increase of the specific gravity of timber from long immersion at considerable depths. He had found all the timber, except the mainmast, in the Royal George, at a depth of about 90 feet, water-logged. The oak timber had increased on an average more than 50 per cent. above its usual specific gravity.

Mr. Bull had prepared considerable quantities of boards for the Calder and Hebble Navigation, by immersing them in the solution for two or three days, which was about double the period allowed by the patentees. He had some specimens of the boards, and in almost all of them there was an appearance of decay in various stages. An oak board 1 inch thick, kyanized in 1839, had lain ever since upon the damp ground exposed to the air: the sap part was entirely decayed, but the heart remained sound; fungus was, however, growing upon it. Poplar boards, kyanized in 1838, 39, and 40, were all partially decayed—those which were not prepared, and had been exposed in the same situation for the same period, showed however more symptoms of decay. In preparing the timber he had always followed the instructions of the patentees, and had tested the strength of the solution with the hydrometer, but had mixed up fresh solution even more frequently than was supposed to be required. On dismantling one of the tanks for holding the solution, he found the iron-work partially destroyed and entirely covered with globules of mercury.

Mr. Thompson explained that the hydrometer was not a correct testing instrument if any vegetable matter was present in the solution: that the tanks on the premises of the Anti-Dry-Rot Company were necessarily made of unprepared timber: that the bi-chloride of mercury in solution would penetrate any length of timber, if the extremities of the sap vessels were exposed to its action, but that it would not penetrate laterally without pressure; it was not therefore surprising that a water-tight tank of unprepared wood should decay on the outside, even if filled with the solution. With regard to the strength of the solution, at first it was believed that 1 lb. of corrosive sublimate to 20 gallons of water was sufficiently strong, and much timber had been so prepared, but experience had since proved that the strength of the mixture should not be less than 1 lb. to 15 gallons, and he had never found any well-authenticated instance of timber decaying when it had been properly prepared at that strength: as much as 1 in 9 was not unfrequently used. In a cubic foot of wood, prepared under a pressure of 70 lbs. per square inch, mercury had been found by the galvanic battery to have penetrated to the heart.

Mr. Horne mentioned that a new process had been invented by Mr. Payne, for rendering timber proof against dry or wet rot, and the ravages of insects; for increasing its durability and rendering it incapable of combustion. The mode of proceeding was to impregnate the wood with metallic oxides, alkalis, or earths, as might be required, and to decompose them in the interior of the wood, forming new and insoluble compounds.

Mr. Taylor drew the attention of the meeting to a Memoir on the Preservation of Woods, which had been read before the French Academy of Sciences by Dr. Boucherie. It was argued, that all the changes in wood were attributable to the soluble parts they contain, which cause fermentation and subsequent decay, or serve as food for the worms that so rapidly penetrate even the hardest woods. By analysis it was found that sound timbers contained from three to seven per cent. of soluble matter, and the decayed and worm-eaten, rarely more than one or two per cent.; since therefore the soluble matters of the wood were the causes of the changes it underwent, it became necessary for its preservation, either to abstract these soluble parts, or to render them insoluble, by introducing substances which should prevent their fermenting. This might be done by many of the metallic salts or earthly chlorides. Pyrolignite of iron was particularly recommended as being a very effective substance, and cheaper than corrosive sublimate. The process was, to immerse the end of a tree, immediately after it was felled, in the solution of metallic salt, when, the vital energies not having ceased, the fluid was absorbed throughout all the pores of the tree, by a process which is termed "aspiration." The fluid had been applied in bags, to the base of the trees

in a horizontal position, or to one of anches, or by boring holes to the a few branches and a tuft of leaves always left at the top of the principal It was necessary to apply the process y after felling the timber, as the of the absorption was found to abate after the first day, and became y perceptible about the tenth day, in dead wood, or where there was cidental interruption of the flow of during growth, the "aspiration" failed: resinous trees absorbed less fluid than any other.

ends proposed to be attained by this were chiefly preserving from dry-creasing the hardness and the elasti-preventing the usual changes of form ting; reducing the inflammability and various colours and odours, according nature of the fluid absorbed.

Bethell remarked that the process ed in Dr. Boucherie's pamphlet, was d with that patented by him July 838, two years before Dr. Boucherie's ntioned in Paris, which was in June, The specification filed by Mr. Be-ated, "that trees just cut down may dly impregnated with the solution of t class, hereafter mentioned, (among is included the pyrolignite of iron,) rely placing the butt-ends in tanks ing the solution, which will circulate e sap throughout the whole tree; or be done by means of bags made of oof cloth affixed to the butt-ends of s, and then filled with the liquid."

Bethell found that some solutions ken up more rapidly by the sap, and ed with it more freely than others, pyrolignite of iron seemed to answer he had not hitherto introduced the in England, because it was much xpensive than the oil of tar, the pyro-costing from 6*d.* to 9*d.* per gallon, oil being delivered at 3*d.* per gal-

Bethell had used similar tanks to described in Mr. Timperley's paper, paring wood with the oil of tar, but oil is very penetrating, previous ex-n of the air had been found unneces-e hydrostatic power being sufficient. ode of working the tanks was to then with timber, close them, and fill ith the oil: a hydrostatic pressure of 00 lbs. to 150 lbs. to the inch, was by means of the force-pumps, and for about six hours; this was suffi-cause the wood to absorb from 35 gallons per load. By this means a charge of timber was easily prepared daily, the cost being about 14*s.* per load.

This was the plan pursued at Manchester for the Manchester and Birmingham Railway, by Mr. Buck, (upon the recommendation of Mr. Robert Stephenson,) and also at Bristol and Bridgewater by Mr. Brunel. Mr. Bethell preferred egg-shaped ends for the tanks, as they resist the pressure better than flat ends.

The solution of corrosive sublimate used at Hull, appeared to Mr. Bethell to be very weak. The advice given by Sir Humphrey Davy to the Admiralty many years since, was to use 1 lb. of corrosive sublimate dissolved in 4 gallons of water, and Mr. Kyan, in the specification of his patent, states that strength; but according to the paper, it appeared that 45 gallons of water were used to 1 lb. of the salt, instead of 4 lbs.

In answer to a question from Mr. Pellatt, Mr. Bethell stated that his experiments on the use of silicate of potash or soluble glass, for rendering wood uninflammable, were not yet concluded: he had proved its efficacy in this point—that as soon as the prepared timber was heated, the glass melted and formed a filmy covering over the surface, which protected it from the oxygen of the air and prevented its catching fire. The silicate also hardened the wood and rendered it more durable. This process was included in his patent of July 11, 1838.

Professor Brande could add but little to what had been said on the subject, but he mentioned a curious appearance in a beech tree in Sir John Sebright's park in Hertfordshire, which on being cut down was found perfectly black all up the heart. On examination, it was discovered that the tree had grown upon a mass of iron scoriæ from an ancient furnace, and the wood had absorbed the salt of iron exactly in the same manner as had been described in the new process. The degrees of absorption of various solutions by different woods, demanded careful experiments, as some curious results would be obtained: it was a question whether a solution of corrosive sublimate in turpentine, or in oil of coal tar, would not be advantageous, as both substances were so readily absorbed by timber.

Mr. Defries explained the construction and action of his dry gas meter, which was exhibited before it was fixed in the gallery of the Institution.

The instrument consists of a hexagonal case with three solid partitions radiating from the centre to the circumference, across each division thus formed is a flexible partition, to the centre of which is fixed a plate, connected by a lever and shafts with the

e 74th vol. of Annales de Chimie, &c.

valves on the top of the case; by means of a combination of levers and cranks, with a worm and screw, a circular motion is given to dials, indicating the quantity of gas which passes through the machine.

The gas, on entering the upper chamber, passes through the valve into the first division, and distends the flexible partition until the lever is carried to a certain point, when, by means of the connecting shaft, the inlet valve is closed, the outlet valve is opened, and the second division commences its action, which is continued by the third, thus producing an equal flow of gas; and an uniform motion is given to the counter-dials, which necessarily indicate the number of times the divisions have been inflated and emptied, and thus measure the quantity which has passed through in a given time.

The instrument which was presented to the Institution, had its sides formed of glass, in order to show the action of the machinery.

March 15, 1842.

"*Description of the Iron Skew Bridge across the Regent's Canal, on the Eastern Counties Railway.*" *By Edward Dobson, Assoc. Inst. C.E.*

This bridge is built with a direct span of 54 feet, at an angle of 79°, with the centre line of the canal. The level of the rails is 14 feet 6 inches above the water, and it is constructed to have a waterway of 44 feet, with a clear headway of 10 feet above the towing-path.

As an appendix to this paper, a description is given of a bridge over the same canal, on the line of the London and Birmingham Railway, on account of the similarity of its construction. The span of this latter bridge is 50 feet, but being made for two double lines of rails, it was thought expedient to have three main ribs instead of two, as in the former. The details of construction of this bridge are also given, with a drawing of one of the main ribs and its tie-bar.

March 15, 1842.

"*Remarks on the Ravages of the Worm* (Teredo Navalis) *in Timber.*" *By Robert Davison, M. Inst. C.E.*

This communication describes the ravages committed by the "Teredo Navalis" upon the fir piles of the foundations of the old bridge at Teignmouth, five arches of which, after having been built only twelve years, fell suddenly; the construction of a new bridge thus became necessary, and it is now in progress under the direction of Messrs. Walker and Burges. The worm is described as entering the wood through a hole not larger than a pin, and perforating the timber in all directions, but chiefly in the direction of the fibre, at the same time increasing the size of the holes even sometimes to an inch diameter; a few of the worms had been found of the extraordinary length of 3 feet. They confine their operations between low-water mark and the bottom of the river, showing that they cannot exist out of water.

A specimen of part of a log, picked up off Jersey, was as much perforated, but in a different manner, the worms having penetrated the wood indiscriminately all over the surface; in some cases leaving in the holes a coat resembling the tail of a lobster about 3 inches in length, which showed that the ravages had been committed by the "Lymnoria Terebrans."

The paper was also accompanied by a specimen of wood sheathing charged with nails from the bottom of a vessel believed to be about 100 years old, together with some of the worms ("Teredo Navalis") for the purpose of showing the peculiar shape of the head—resembling a pair of forceps, with which they cut away the wood.

March 15, 1842.

"*Description of the Roof of Messrs. Simpson and Co.'s Factory.*" *By John Boustead, Grad. Inst. C.E.*

The truss of this roof is double, consisting of two frames of Memel timber. The principals are fitted into cast-iron shoes, resting on the walls, with projections let into the wall-plates; they taper towards the ridge, and there abut against a cast-iron ring-piece, through which a wrought-iron bolt, 1¼ inch diameter, passes, and answers the purpose of a king-post in supporting the collar-beam. To the under side of this beam is attached a heel and eye-plate, to either end of which are linked bolts passing between the principals, and secured by nuts at the backs of the shoes, thus forming efficient ties to resist the thrust of the principal rafters.

The slate-boards are supported by five purlins 4 feet apart, and abut against a ridge-piece resting on the kings.

The span of the roof is 34 feet 3 inches. The pitch is about 3 to 1, and the principals are placed 9 feet apart.

The scantlings of the principal timbers are:—Principals 9½ by 2½ inches, tapering to 6½ by 2½ inches; collar-beam 7 by 3½ inches; purlins 6 by 4 inches; wall-plates 6 by 4 inches; slate-boards 1 inch thick; ridge-piece 10 by 2 inches.

The principals were sawn out by a template, so as to insure the given taper and the

accuracy of the angles of the ends; they were then laid in a horizontal position placed at the required angle, and the collar-beam inserted ½ inch deep into each principal, and secured by bolts ½ inch diameter; the mode of raising the roof is then described.

Some of the advantages of roofs of this construction are stated to be, economy in materials and workmanship, with lightness and simplicity, and that all sagging of the timbers may be rectified by screwing up the nuts of the kings and shoes.

The truss is recommended for buildings where lofty apartments or coved ceilings are required, and also for its presenting so few points for the suspension of heavy weights that may subject the timbers to strains for which no provision has been made.

From the examinations that have been made, this roof seems to answer satisfactorily: it has been erected three years and a half, and has sustained heavy falls of snow, but the ridge and rafters have preserved their lines perfectly, and the walls show no signs of having been subjected to undue pressure. The design of the roof is simple, its appearance light, and it may be considered an interesting specimen of the art of simple carpentry, assisted by iron-work.

March 22, 1842.

"*Remarks on Machines recipient of Water Power: more particularly the Turbine of Fourneyron.*" *By Professor Gordon (Glasgow.)*

Notwithstanding the diminished importance of water power since the almost universal application of the steam-engine, some situations may still be found, in the mining districts of Cornwall, of Derbyshire, and of Cumberland, the Highlands of Scotland, and generally in the districts comparatively destitute of cheap fuel, where it is desirable to render falls of water available.

The theory of water power as it now stands may be announced in general terms thus: "The mechanical effect obtained is equal to that of the moving power employed, minus the half of the *vis viva* which the water loses on entering the machine, and minus the half of the *vis viva* which the water possesses when it quits the machine."

Bernoulli recognized the second cause, and soon after, Euler, the first. Borda, in his "Mémoire sur les Roues Hydrauliques," in 1767, gave the proposition in precise and general terms: whence he concluded, that to produce its total mechanical effect: "the water serving as moving power, must be brought on to the wheel with impulse, and quit it without velocity."

This principle being admitted, the circumstances next to be considered are, the height of fall, the supply of water, and the nature of the work to be done.

These positions being laid down, the author proceeds to examine the relative efficiency of water-wheels of various constructions.

The undershot wheel acted upon by the velocity of the water when confined in a rectilinear course, or when hung freely in a stream: in the former case the efficiency of the machine is equal to 32 per cent., or nearly ⅓rd; in the latter the ratio is 42 per cent, or about ⅖ths.

The breast wheel is generally applied to falls of from 4 to 8 feet; in these the efficiency reaches as high as 60 to 65 per cent. of the mechanical effect of the fall of water. The buckets being filled to ⅔rds of their capacity, their velocity is seldom less than from 7 to 9 feet per second.

The consideration of this wheel led Poncelet, in 1824-25, to the invention of the "undershot wheel with curved floats," the efficiency of which has been found equal to from 65 to 75 per cent. The velocity of this may be 55 to 60 of that of the effluent water—a velocity equal to that due to nearly the whole height of fall; hence the efficiency becomes "about double that of the ordinary undershot wheel." This wheel has not been much employed in Great Britain, although frequently used in France and Germany.

The overshot wheel is most generally employed in Great Britain for falls beyond 10 feet in height, and some excellent examples occur for work of every description, from rolling iron to spinning silk. Its efficiency averages 66 per cent., but has risen as high as 82 per cent.

The economical use of water as a moving power, varying in particular cases, rendered desirable the discovery of a receiver capable of general application, in all circumstances of height of fall, quantity of water, and amount of work to be done; and after intense study Fourneyron produced the Turbine, the peculiarities of which form the subject of the paper.

The imperfect horizontal water-wheels which have been used for centuries in the mountain districts of central Europe, and in the northern Highlands, are mentioned; then are noticed the experiments of MM. Tardy and Piobert, and the allusion by Borda to horizontal wheels; then a general description is given of the numerous experiments made up to the year 1825, when M. Burdin constructed wheels in which the water was received at the circumference of a vertical cylinder, descended in conduits, placed in a helical form round the surface of

the cylinder, and made its escape at the bottom: the efficiency of these wheels was stated to be 75 per cent., but no exact experiments were ever instituted.

The defects in all the previous machines, led to the invention of the Turbine, as it is now designed by M. Fourneyron: its construction may be compared to one of Poncelet's wheels with curved buckets, laid on its side, the water being made to enter from the interior of the wheel, flowing along the buckets, and escaping at the outer circumference: centrifugal force here becomes a substitute for the force of gravity.

The mechanical construction of the Turbine is then given, and its action is thus described. The water, when admitted to the reservoir, rises to a certain level, exercising a hydrostatic pressure proportional to the height of the column, and on the sluice being raised it escapes with a corresponding velocity in the direction of the tangent to the last element of the guide curves, which is a tangent to the first element of the curved buckets; the water pressing without shock upon the buckets at every point of the inner periphery, causes the wheel to revolve, then passes along the buckets, and escapes at every point of the outer periphery; by which arrangement the size of the machine, even for a large expenditure of water, is kept within narrow limits.

The advantages of the Turbines are stated to be—

1st. That they are with like advantage applicable to every height of fall, expending quantities of water proportional to the square root of the fall, their angular velocities being likewise proportional to these square roots.

2nd. That their net efficiency is from 70 to 75 per cent.

3rd. That they may work at velocities much above or below that corresponding to the maximum of useful effect, the useful effect varying very little from the maximum nevertheless, and—

4th. They work at considerable depths under water, the relation of the useful effect produced to the total mechanical effect expended not being thereby notably diminished.

These advantages are stated to have been realized in the extensive practice of M. Fourneyron, of M. Brendel in Saxony, and of Herr Carliczeck in Silesia, as well as other engineers.

A comparison of the theory and practice of the construction is then instituted, and the following conclusion is drawn:—That if one Turbine has been constructed which works well under a known fall, expending a volume of water exactly measured, this *Turbine* would serve as a type for all others. Knowing the fall and the volume of water to be expended, the Turbine would be made similar to its type. Its linear dimensions would be those of the type, directly as the square roots of the volume of water, and inversely as the fourth roots of the heights of fall. Its angular velocity would be to that of the type, directly as the fourth roots of the cubes of the heights of fall, and inversely as the square roots of the volumes of water. These practical rules were first made manifest by M. Combe, of the Ecole des Mines.

A general review is then given of most of the Turbines erected by M. Fourneyron at Pont sur l'Ognon, at Fraisans, at Niederbronne, and at Inval, upon which last were tried the experiments which completely established the reputation of the Turbine as an applicable machine. The details of these experiments are given, whence the mean results appear to be, that the height of fall being 6 feet, 6 inches—

With an expenditure of 35 cube feet of water per second, the efficiency was—

				= 0·71
63 cube feet	,,	,,		= 0·75
79 ,,	(for which it was constructed)			= 0·87
126 ,,				= 0·81
144 ,,				= 0·60

These experiments were tried by the application of Prony's Brake Dynamometer, to the vertical shaft of the Turbine itself.

M. Arago's proposition for employing the power of one branch of the river Seine upon Turbines, to replace the wheels at the Pont Nôtre Dame, thus giving about 2000 horse power for supplying Paris with water, is then mentioned, as also the results of experiments with very low falls; showing that—

With a fall of 3 feet 9 inches, the efficiency of the Turbine was—

			= 0·71
2 feet	,,	,,	= 0·64
10 inches	,,	,,	= 0·38

The Turbines at Müllbach and Moussay are mentioned, as are the failures of several of these machines constructed by other engineers, and the paper concludes with an account of a Turbine at St. Blazeux in the Black Forest, where the height of the fall is 345 feet, the quantity of water 1 cube foot per second, and the reported efficiency from 80 to 85 per cent.

IMPROVED STREET-PAVING ASSOCIATION.

The vexatious and illiberal opposition which the excellent system of Wood Paving has met with in the parish of Marylebone, where it was first introduced into the metropolis, and where the largest, and, on the whole, best specimens of it yet laid down, are to be seen, has led to the formation of a "Marylebone Practical and Scientific Asso-

ciation for the promotion of Improved Street Paving," under the auspices of Lord Nugent, Sir Geo. Staunton, Sir R. P. Jodrell, General Alexander, Chas. Cochrane, Esq., and several other public spirited gentlemen of that quarter of the town.

It is judiciously proposed, however, that the Association shall not confine its operations to the consideration of wood pavement exclusively, since there exists but little doubt, that in the advanced state of chemistry and mechanics, other materials and methods may be discovered for the formation of carriage ways, equally deserving of their attention.

The leading objects of the Association, therefore, are to be, 1. To form a museum of all the improved systems for making carriage ways. 2. To collect and disseminate the most correct information respecting them. 3. To invite the co-operation of men eminent for their practical and scientific experience on this subject. 4. To adopt such measures as will ensure justice and impartiality to inventors and patentees. And, 5. To pursue such a course as will lead to the introduction of that pavement, which for its general utility and economy, shall be most deserving the approbation and support of the public.

We can anticipate nothing but good from such an Association, and cordially wish it every success.

A PASSENGER PROPELLED LOCOMOTIVE—REMARKABLE PERFORMANCE.

(From a Correspondent.)

On Saturday last, a very successful trial was made at Holywell (Flintshire) of a carriage constructed by Mr. P. Williams, surgeon, of that place, to run on common roads, and to be propelled by the passenger or passengers. Two men propelled themselves in it, with little difficulty, up a hill of considerable rise, at the rate of at least 6 miles an hour; for a good walker could not keep pace with it, and even had to run to follow it. On a level they attained a speed of 9 and 10 miles an hour, and returned down the first mentioned acclivity at the rate of about 15 miles an hour. The experiment was most satisfactory, and justifies the opinion that this carriage is probably the best combination of power which has been yet applied to such a purpose.

The parties to whose use this carriage seems most adapted, are young people and invalids. The exercise of propelling it is of a nature to call into operation all the columnal muscles in a most effectual manner, and thereby to give great tone and vigour to the muscular system. Invalid ladies and gentlemen may have it worked by servants, whilst they themselves are simply occupied in guiding it. The propulsion of the carriage may be aided by the effect of the wind acting on a revolving umbrella, kite, or sail. With little fatigue, it will certainly convey two or three individuals, on a good hard surface, at the average rate of about 8 miles an hour. By 60 revolutions per minute, a rate of speed will be attained of upwards of 10 miles per hour. A pony may be applied when it is considered desirable not to use the machinery.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

JOHN EDWARDS, OF COW CROSS, GENTLEMAN, *for an improved strap or band for driving machinery, and for other purposes.* Enrolment Office, May 9, 1842.

The flat straps or bands hitherto commonly used for driving machinery, are made of leather, or of some woven fibrous substance, as hemp or wool; and all such straps or bands are well known to wear away rapidly under the great degree of friction to which they are subjected. Catgut has been also made use of for the purpose of driving machinery, with great advantage in point of durability; but it has been so employed in the form of cords only, consisting of strings or threads of catgut twined together, and solely adapted to run in grooves. The improvement which is the subject of the present patent, consists in making flat straps or bands suitable for running on plain surfaces or drums, of catgut, and of any required breadth or length, or of endless lengths, without any joinings being visible, or at least there being any inequalities of surface at the joinings. The strings of catgut are woven into these flat bands by means of a loom of the sort used by wire weavers, and by following the same methods as they practise; and the joinings are made by any of the well-known methods of splicing, care being taken to cut or burn off the ends of the interwoven threads or strands close with the surface of the strap or band.

JAMES YOUNG, OF NEWTON LE WILLOWS, IN THE COUNTY OF LANCASTER, CHEMIST, *for certain improvements in the manufacture of ammonia and the salts of ammonia, and an apparatus for combining ammonia, carbonic acid, and other gases, with liquids.* Enrolment Office, May 11, 1842.

To obtain ammonia, Mr. Young fills a retort with two parts in weight of the substance called guano, imported into this country from Peru and other parts of South America, (chiefly for agricultural purposes,)

and one part of slaked lime. He then closes the retort, and mixes the two materials thoroughly by means of an agitator. The retort is next subjected to heat, (of a moderate degree at first, but heated till the bottom is nearly red hot,) which not only sets free the ammonia of the guano, but decomposes the uric acid contained in it, which yields also a considerable portion of ammonia. But as other gases besides ammonia are liberated by this process, in order that the ammonia may be separated from them, the whole of the gaseous products of the retort are passed through a condenser of a peculiar construction, filled with water. The ammonia is absorbed by the water, while the other gases being insoluble, make their escape through a pipe provided for the purpose, at the top of the condenser.

To form solutions of carbonate, sesquicarbonate, and bicarbonate (salts) of ammonia, the condenser is filled with a solution of ammonia, and carbonic acid passed through it.

To form solutions of the sulphate or muriate of ammonia, diluted sulphuric or muriatic acid is employed for the condensing liquid.

And for combining generally all soluble gases with liquids, the patentee states, that he finds a condensing apparatus of the particular form described by him, superior to all others. The advantage peculiar to it, appears to be that the gases are made to traverse over or through a very large body of water, by means of inclined shelves, while the head of water, the pressure of which has to be overcome, is extremely small.

Robert Stirling Newall, of Gateshead, in the County of Durham, *for improvements in the manufacture of flat bands.* Enrolment Office, May 16, 1842.

The improvements of the present patentee consist in manufacturing the flat bands used in mining operations, and for driving machinery, *exclusively of iron or other metals.* Three processes are described. According to the *first,* a flat band is manufactured, by subjecting a piece of iron or other metal of good quality, preferring that known as the best charcoal iron, manufactured in the usual way by rolling, to a process of drawing through rectangular orifices, or dies of hardened steel, in the same manner as in the ordinary and well-known operations of tube or wire drawing. The patentee considers it to be of importance that the piece of metal to be operated upon should be drawn through the die in a straight line at right angles to its edge; and as it is difficult to roll iron beyond a certain length, he suggests that it may be found convenient to draw it in a hot state through dies. Again, as in the process of drawing the metal becomes hardened, the patentee directs that (if necessary) it should be annealed by heating it in a furnace, and after the oxide has been removed from it by means of diluted sulphuric acid, that the process of drawing should be repeated when cold. When a band of considerable length is required, it may be necessary to unite two or more bands together. Various methods of effecting this junction are pointed out and illustrated by drawings. Scarfing the ends and riveting are considered to be much preferable to welding or brazing, as the operation of hammering in welding gives a brittleness to the metal, which no subsequent process of annealing can remove, so as to give the hammered part the same strength which it had before; and in brazing, the union of the two metals is not such as can be depended on or should be trusted to. These bands, when of iron, may vary in thickness from $\frac{1}{16}$ to $\frac{1}{4}$ of an inch, and in breadth according to the strength required. Flat bands manufactured in the way described, are stated to possess greater strength and durability than those of hemp or any similar material of the same weight; and if extreme lightness, with the greatest degree of strength, be required, steel may be used instead of iron. In some situations where the iron becomes rapidly corroded, the bands may be made of copper instead of iron or steel.

The patentee's *second* improvement consists in manufacturing flat bands of a combination of narrow bands or strips of iron, or other metal, which bands, for some purposes, particularly in deep mines, possess advantages over the flat bands before described, on account of the greater security against accident or sudden breaking which such a combination presents. The strips of metal are arranged side by side and fastened to cross pieces. Metal drawn through dies, as before described, is used; or metal rolled in strips, taking care to select such as are straight and free from flaws, and, if necessary, to cut their edges true and parallel, which may be done by circular shears. The pieces of which the flat band is to be composed are laid side by side, and kept in a state of equal tension by weights acting over pulleys, while the cross pieces are riveted on and joined at the end by a butt or by an overlap joint. The cross pieces may be from 18 inches to 5 feet apart, the breadth and thickness of the component pieces of the band varying according to circumstances.

The *third* improvement consists in forming a flat band, by weaving narrow strips or wires of metal in a loom, the strips or wires which constitute the warp being wound on

e bobbins and kept at a uniform ten-ring the operation of weaving. It is :o be, in most cases, advisable to have re used as the weft of smaller size at used as the warp.

D OF LOWERING THE "LIGHTS" IN E PARTICULAR ENGRAVINGS EXE-ED IN THE WOOD-CUT MANNER.

I here submit a new method of low-he "lights" on the surface of some lar engravings executed in the wood-anner, as, for instance, the copper produced by electrography, and those by Mr. Woone's stereotype process: s of the pictures in both styles being height, on account of the design being ed on a flat even surface. The metal r blocks are first "stopped" out in rkest tint by the application of a hair-dipped in some strong varnish, as that al, asphaltum, or seed-lac, the first med being the most preferable; and ttached to and immersed as positive in the single-cell voltaic apparatus n electro-metallurgic experiments, let-remain until the parts untouched with n have been corroded to the requisite It should then be taken out, dried, e varnish-brush applied to those por-which may be considered deep enough, ing alternately the varnishing and cor-, until the cut is graduated to your The character of the engraved lines ot be much injured by the electro-g process, as the corrosion proceeds evenness and regularity. The more application of nitric or other suitable might probably be found efficacious the design is of a bold or rude cha-, and strongly lined.

a mode of lowering blocks of the description for typographic printing ng been sought for, the insertion of tle hint may be of service to some of aders of the Mechanics' Magazine. I he honour to be, your obedient ser-

M. T. BRAZENDALE.

THE MAMMOTH STEAM SHIP.

,—I have, in common, I dare say, with of your readers and subscribers, been ong time expecting to see some account progress made in the building of the vessel, particularly as it is understood are three great principles in the course ng tested in her construction. Will e kind enough to allow me to ask the favour of some one of our Western friends to furnish us with such particulars as may be known to them, of its present state of forwardness? The three principles I allude to are, 1. The fitness or suitability of sheet iron for such enormously large structures. 2. Has the practice of transatlantic steam ship-building, been carried far enough to justify the experiment of magnitude attempted in this case, and is it necessary in a mercantile point of view? (The recent voyage of the Great Western to Liverpool with 28 passengers, appears to prove otherwise.) 3. What are the advantages expected to result from the use of the "Trunk Engine?" Does it consist in cheapness of first cost, simplicity of parts, compactness and taking less room, or less consumption of fuel?

Some information on these general heads, as soon as they can be collected, will much oblige many of your readers, as also, Sir, your obedient servant,

AN OLD STEAM BOAT ENGINEER.

Tottenham,
May 17, 1842.

NOTES AND NOTICES.

The "Locomotive" Steamers.—A new steamer has made its appearance in the river, with the name of the "Locomotive No. 1," and is to be speedily followed, it is said, by several others of the same description. It is a small boat, of the class that ply between the bridges, and is called the "Locomotive," from the circumstance of its being fitted with boilers of the same sort as are used in railway locomotives — namely, *high-pressure* tubular boilers. There is much fairness in this choice of a name, since it indicates at once to all concerned the degree of danger to which they are about to be exposed in embarking in the vessel. People accustomed to travel by the River boats, which are generally worked at 4 and 5 lbs. pressure, might but for this warning, have justly complained that they had been entrapped into a travelling proximity with a pressure of from 70 to 80 lbs. Whether there is any actual danger or not attending the use of such high-pressure boilers, may be matter of question; but there can be none about the perfect propriety of letting every one know what he has to look to. A correspondent (Vulcan) suggests, that it would perhaps be still fairer if the boat were called "The High Pressure No. 1."

A Floating Manufactory.—Amongst the strange craft to be seen navigating the Ohio, is a floating "Glass works." "A large boat," says Mr. Le Cras, "is fitted up with a furnace, tempering oven, and the usual apparatus proper for such an establishment. It is on full blast every night, melting glass ware, which is retailed all along shore, as the 'Works' float down the stream."

Quick Packing.—A workman at the Sandwich (Mass.) Glass Factory has been known to roll in separate papers in one day five thousand three hundred and sixteen tumblers. Some one noticing the number by a watch, saw him pack twelve dozen in six minutes!—*Le Cras.*

Weaving and Patriotism Extraordinary.—The *Limerick Chronicle* has a strange story about a Garryowen weaver, of the name of Lyons, who can produce "a man's apparel complete from the loom without stitch or seam." "We have seen," says our contemporary, "coats and trowsers, with but-

tons and all other necessary appendages, wrought by this poor but most ingenious artist." The strangeness, however, consists less in the man's performances, though certainly they are remarkable enough, than in the use which he is about to make of his discoveries in weaving. "Rather than injure," so the story proceeds, "such of his fellow-countrymen as carry on the business of woollen-drapers, and follow the trade of merchant tailors, by selling his secret and teaching his art to an English capitalist *that has offered for both*, and who, by the application of steam power and appropriate machinery, could manufacture all sorts of men's clothing, and thereby, at no remote period, leave multitudes of tailors disemployed," he has determined to emigrate with his invention to "some distant land!" There is a patriot for you! A perfect "gem!" But he has, it appears, his consolation. He crosses the Atlantic to find "a home and happiness" under the star-spangled banner, and when he "shall have settled at New York, whither he intends to emigrate," his mother country is to be paid off in grand style for its indifference to such extraordinary merit. "Jonathan will heap reproaches on us for neglecting to encourage and succour the most extraordinary self-taught weaver that ever left our shores." Jonathan ought rather —if there be any truth in the story—to shower thanks and blessings upon us for making him such a present. But since "an English capitalist" has already offered to buy both the patriotic weaver's secret and to pay him for teaching his art, what ground is there for complaining that he is in want either of encouragement or succour? Why not close with the English capitalist at once? Why not eschew blarney and stay and make himself rich and happy where he is?

American Locomotives.—A remarkable performance on the Philadelphia and Reading Railroad.— A new geared truck locomotive-engine, built by Messrs. Baldwin and Vail, with six wheels and outside connexions, and weighing, in running order, 30,000 lbs., hauled lately a train of 117 loaded cars, weighing in all 590 tons, from Reading to the inclined plane, on the Columbia Railroad, fifty-four miles, in five hours and twenty-two minutes, being at the rate of over ten miles per hour the whole way. She consumed 2 6-10ths chords of wood, and evaporated 3110 gallons of water. Whole length of train, 1402 feet, or eighty-two feet over a quarter of a mile. Whole length of level, over which the train was hauled, twenty-eight miles; longest continuous level, 8 1-10th miles; total fall, from the point where the train was started to where it stopped, 210 feet.

Rates of Speed on Railways.—The following are the average rates of speed observed on seven of the principal English railways; London and Birmingham, 27 miles per hour; North Midland and Midland Counties, 29; Newcastle and Shields, and London and Brighton, 30; Great Western, 33; Northern and Eastern, 36.

Mills Started and Mills Stopped.—It appears, from the Report of the Factory Commissioner, Mr. Horner, that in his district, which includes Lancashire, the North Riding and part of the West Riding of York, Northumberland, Cumberland, and Westmoreland, there have been, during the three last years, 91 new mills started, employing engines of 3,350 horses power and 16,750 hands; and 138 stopped, which employed engines of 6,788 horses power and 29,363 hands.

Machinery the Friend of Wages.—We believe it may be safely asserted, that wherever machinery has been introduced, there the aggregate amount of wages paid has been increased, and that wherever it has diminished, there the aggregate amount of wages paid has fallen likewise. Machinery has never increased but as a means to the increase of wealth. When wealth is increasing it must be employed in further production, or it would not continue to increase. But farther production requires greater employment of labour, and at the same time increases the fund for its remuneration. From this increased fund the labourer derives an increased share, for the object of the employer is to augment the amount as well as the *rate* of his profit. And this he effects not by diminishing his hands and limiting his new machine power, but by extending its application to the widest range commensurate with the funds he can employ to make and to work it, so as to maximise its capacity and compass the largest scope both of product and profit. —*Facts and Figures.*

Death of Mr. Samuel Seaward.—We lament to have to record the death, on the 11th inst., of this eminent practical engineer. Few establishments in this country have contributed more to the progress of steam navigation, than the firm of Messrs. Seaward and Capel, of which the deceased was an active partner. Mr. S. Seaward was a Fellow of the Royal Society, and a Member of the Institution of Civil Engineers, in the proceedings and welfare of which he latterly took a most lively interest.

Four and Six Wheel Engines.—From the Returns made to the Board of Trade by the different Railway Companies, it appears that the number of six wheel engines now in use is 605, and of four wheel 224. We hope, ere long, to see the latter number reduced to 0.

The Transatlantic Steamers.—The Great Western, which sailed from Kingroad, Bristol, on the 2d ult., for New York, reached that city on the 17th, after a passage of 14 days and 12 hours. She sailed from New York for Liverpool on the [illegible]th ult., and arrived off the floating-light early on the morning of Wednesday, the 11th inst., having made the run in 12 days and 8 hours, the shortest passage ever made between New York and Liverpool, as well as the shortest ever made by the Great Western. She has certainly made the passage to Bristol in a space of time very little greater—12 days and 12 hours—but the difference of the distance between New York and Liverpool, as compared with the distance between New York and Bristol, is equal to at least six hours' steaming.— *Liverpool Times.*

East India Company's Steam-Frigate Acbar.—On Sunday last this splendid war-steamer left her anchorage at Gravesend, bearing the pendant of Commodore Pepper, of the Indian navy. The Acbar is a steam-frigate of the first class, armed with two eight-inch guns, and four long 32-pounders, with a complement of 160 men; carrying five boats, on two of which are mounted brass 12 lb. howitzers. The engines are of the collective power of [illegible] horses, manufactured by Napier of Glasgow. She carries 500 tons of coal, which, with a consumption of a ton an hour, will enable her to steam 20 successive days. The Acbar made her passage from Gravesend to Falmouth, a distance of 370 miles, in 36 hours, which gives an average speed of more than 10 miles an hour.—*Times.*

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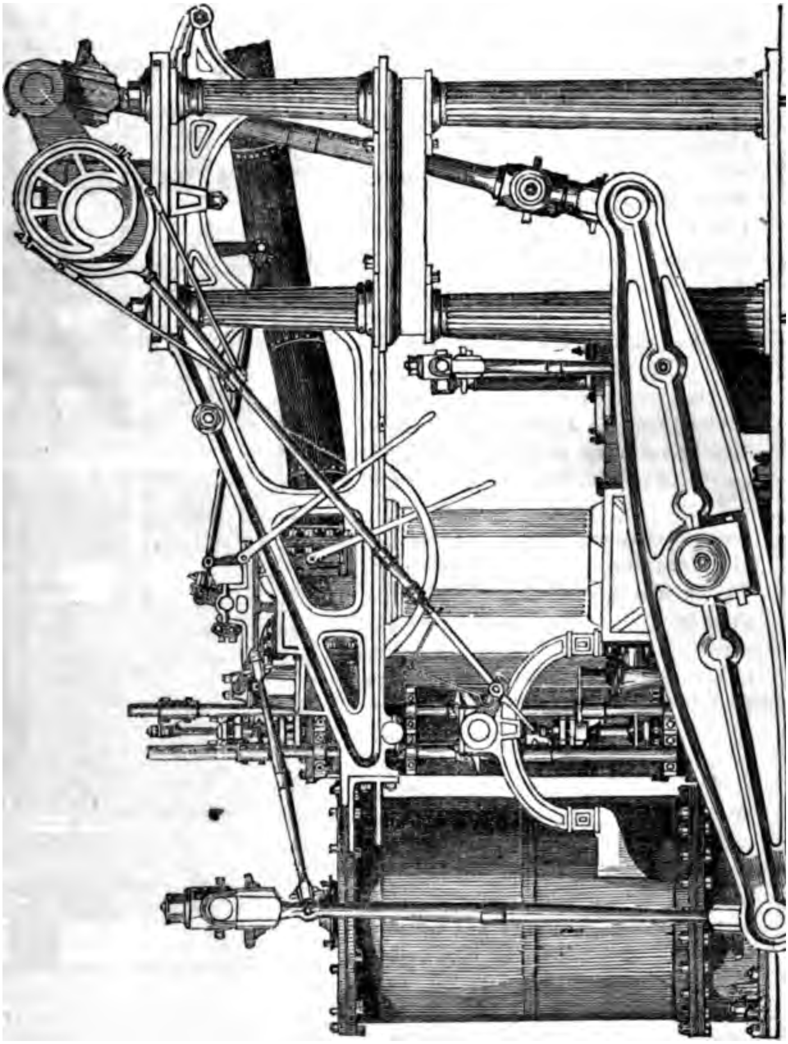
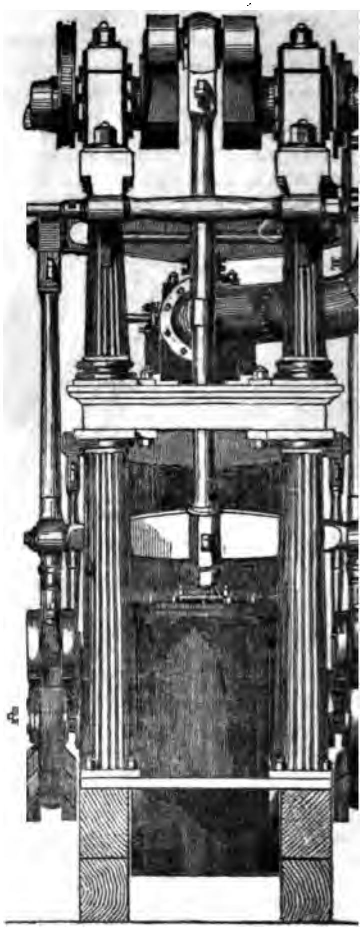


AMERICAN MARINE-STEAM ENGINE,
BUILT BY MESSRS. WARD, STILLMAN, AND CO.

AMERICAN MARINE STEAM ENGINES FITTED TO THE SPANISH FRIGATES "EL REGENT" AND "EL CONGRESO."

We had occasion, some time ago, to notice in rather unfavourable terms the steam engines manufactured in the United States for the Russian frigate *Kamstchatka*, which appeared to us, both in design and workmanship, much inferior to the productions of our English workshops, while they had cost a great deal more. The Spanish Government has since had two steamers, *El Regent* and *El Congreso*, (formerly the *Eagle* and *Lion*,) fitted with engines at New York by Messrs. Ward, Stillman, and Co., of the Novelty Iron Works, who have kindly enabled us to lay the accompanying engravings of them before the readers of the *Mechanics' Magazine*. We take pleasure in acknowledging that they fully establish the truth of the representation made to us by an American Correspondent, (vol. xxxvi. p. 222,) that the *Kamstchatka's* engines were by no means to be regarded as fair specimens of what his countrymen could do in this line, having been built under peculiar circumstances, which did not give fair play to their genius and skill. The engines supplied to the Spanish frigates are in every respect of a much superior character, and approach nearer to English excellence than any of foreign manufacture which have yet come under our notice. The cylinders are 42½ inches in diameter; the length of stroke, 55 inches. We have not been informed of the dimensions of the *Regent*, but we presume they must be nearly similar to those of *El Congreso*, which is stated to be 154 feet in length, 30 feet 8 inches in greatest breadth, and 14 feet 8 inches in depth. The engines of both vessels have, we are assured, been in use "for a whole year without requiring any repairs whatever." We are promised a copy of "the log of several voyages;" and when we receive it shall be able to speak of the performances of the vessels in other respects.

Sectional View.



)th No. (16th Nov. 1839) y full account of the Bude isted at that time, extracted es of Evidence taken before mmittee" appointed to in- best means of lighting the nmons. The light was then roduced by means of a com- amp, with cotton and sperm e centre of the flame of which xygen was passed, in place c air, as usual. The oxy- ned by the dry distillation of iron retorts. After a short Iouse of Commons, it was oil lamps thus fed with expensive, and difficult to r. Ure.) Mr. Gurney then r the sperm oil, the naph- gas invented by Mr. Lowe, l in our last No. (p. 392) the oxygen as before. A intensity was thus obtained, cess too was found objec- e long run, owing to a large naphtha becoming liquified, g itself in the pipes of dis- Mr. Gurney then devised process altogether; he ob- me from the ordinary coal pure state—abandoned the um of oxygen, trusting to ing atmosphere (as others equisite supply; and added nechanical contrivances for e supply of gas and atmo- nd diffusing the light pro- this new process he took out h March, 1841,) and this it stitutes the Bude Light of ay, as in use at the House and elsewhere.

urney's mode of purifying coal gas, is to pass it, as it he public gas main, through ar to a common gas purifier, h a mixture, either in a dry oistened state, composed of ate of zink, 2 parts subace- 2 parts chloride of baryta, ulphate of manganese. The zink is the principal agent, ers seem added more for e than on any other account. " says Mr. Gurney, "I pre- described means of applying entioned materials, I do not confine myself thereto, so long as the means resorted to are such as to bring the gas into contact *with muriate of zink*, with or without other suitable materials, in the passage of the gas from the gas-main to the burner or burners." *Specification.* Mr. Alexander Croll, the present Superintendent of the Chartered Gas Company's Works at Brick Lane, took out a patent two months before the date of Mr. Gurney's, for purifying gas by contact with *muriate of zink, as it comes from the retorts*; and this circumstance may serve, perhaps, to explain both Mr. Gurney's addition of the superfluous materials and the limitation of his claim to the use of the muriate of zink "*in the passage of the gas from the gas main to the burner or burners.*"

2. Mr. Gurney regulates the supply of gas and atmospheric air by the following means. He uses a burner consisting of two or more hollow concentric rings, perforated with a great many small holes on their upper surfaces, the atmospheric air being admitted to flow freely up between the rings; and the flame is enclosed within two conical chimneys, which are also concentric (as it were) to one another; only, that there is a small space left between the top of the one and bottom of the other, which admits air to the exterior of the flame.

3. To reflect or diffuse the light, there are two circular concave reflectors, placed back to back, which project from the upper chimney at a point nearly coincident with the middle of the flame, to a distance all round more than equal to the diameter of the chimney; one reflecting the light downwards, and the other upwards. A second upper chimney is also occasionally used, called by Mr. Gurney "a refracting zone," which is "cut on the outside into prismatic projecting rings at such angles as to direct the light in the desired directions," and rests on the twin reflectors. A ground glass shade may be added or not, according to the brilliancy of illumination desired.

Dr. Ure calculates that the Bude Light, as thus improved, gives as much light as the best Argand gas flame, with only half the expenditure of gas; and he ascribes this, first, to Mr. Gurney's burner giving, by means of its concentric rings, a compound flame, (like that of the

flames of two candles brought into close contact,) the circles of which "mutually enhance each other's temperature," and consequently illuminating power; and, secondly, to the circumstance that by means of Mr. Gurney's concentric series," the prejudicial excess of atmospheric air is prevented, and only so much permitted to come into contact with the gas, as will effect the due separation and ignition of its carbon, even at the origin of the flame."—(*Lond. Jour.*)

With great respect, however, for Dr. Ure's authority, we must confess that his two reasons appear to us far from being sufficient to account for the great superiority ascribed to this new light. The flame produced from any burner whatever, of more than one hole, as long as the holes are close together, is just as much a "compound flame" as that of Mr. Gurney's. The twelve columns of flame rising in a single ring from a twelve-hole Argand burner of the common sort, do just as much "mutually enhance each other's temperature," and consequently illuminating power, as if they were arranged in two rings. The admission of the atmospheric air to the flame, in the exact quantity requisite to "effect the due separation and ignition of its carbon," would be something more to the purpose, if this could be really shown to be effected by Mr. Gurney's plan; but in what respect is this admission more exactly regulated in his lamp than in others? He gives no proportions for his apertures of admission, and places them just where others do. The bottom apertures which admit the air into the interior of the flame, are smaller than usual —that is all; but this seems rather an accidental consequence of the concentric ring construction, than an antecedent condition of it. We are confirmed in this view of the matter by Mr. Gurney's claim on this head, which is simply to the "lighting apartments or rooms by means of burners composed of concentric rings of tubes, *combined with suitable glass chimneys*"—not a word of suitable apertures.

We should have thought something might be due to the process of purifying, but this appears to count with Dr. Ure for nothing; and if it be true, as is currently reported, that the process of purification has been abandoned at the House of Commons, he may not be far wrong in this respect.

After all, there seems to be goo son for concluding that the reflecto refractors, combined with Dr. better system of ventilation, have to do with the superiority of thi at the House of Commons tha thing else. The Bude Lamp whi set up at the bottom of Waterloo where the ventilating system cou be so well brought into play as Stephen's, has never been of the ordinary brilliancy represented in paper paragraphs, and gives ord no more light than would be affor an equal body of common gas flan rounded with reflectors. The House gave Mr. Gurney a comi to fit up the Orford Lighthouse ing to his views; but after a brie the Bude apparatus has been enti moved from that establishment; cause is unreservedly stated to b the Gurney light was found to no more illuminating power th other light, while his system of re was not nearly so good for maritim poses as others previously in use. Northern Light Commissioner given an order for a Bude appar be applied to one of the light under their management; but on h of the Orford failure, that ord been countermanded.

GLEANINGS OF A TRAVELLER IN AM —EXPEDITIOUS BISCUIT BAKING- PLE HOT WATER APPARATUS.

Sir,—Some years since I saw, i York, a very simple mode of b which I shall endeavour to describ recollection. It may furnish to and small cake-makers some usef in the construction of the oven on of economy. The inventor wa George Dencale.

In the middle of the shop was e of brick work, an oven, about 4 fee 12 feet long, and 6 feet wide. The surface, or top, of brick and mort no opening whatever. The end, constituted the front, had, near the g an opening with a metal door, lil of any common furnace, through the fuel was introduced, and pushed forward so as to cover the of the floor within the walls of this Above the furnace door, some 12

ick-work had an opening of 6 or 8 height, the entire width of the an equal opening was in the oppo-d. Outside, and immediately facing opening, a wooden cylinder was l, that at the front having a winch; igth of each cylinder corresponded that of the opening. A piece of ttice-work, the width of the cylin-length, passed over the cylinders, ontinued underneath both, so that ds met, and were so tightly united n turning the winch the wire-work ed freely (like an endless chain or similarly circumstanced,) length-through the oven over the ignited

: dough-cakes being brought to the n, he placed a row on the wire-then gave the winch a turn; next second row was placed, and the again turned; and thus in succes-ntil the first row had arrived at the : opening, where the cakes fell over linder into a basket, completely

oticed also an economical method plying a house with hot water day ght. Four old gun-barrels were ted with leaden pipe so as to form idiron-shaped tube, by which there iree necks and two ends of leaden The ends of the barrels were laid ck-work six inches from the l, and the leaden necks covered ortar: the four barrels lay in the horizontal plane: under and over he fire was placed. From each of connected ends of the gun-barrels led a piece of lead pipe, which l a wooden chest or barrel with a tight lid. The pipes entered the one much higher than the other, r that the cold or heavier water in oden vessel should descend through wer, and the heated water in the ascend into the water vessel h the upper pipe, and thus facili-e circulation, which is productive aring noise, the degree of which es the temperature of the water. ater vessel may be in one kitchen, n-barrels in a different, or in a g-room adjoining, according to the of pipes and convenience required. the water is boiling in the covered is surprising the very few hot round the barrels, required to keep l night. For bathing at night, on an emergency, and in hospitals, the plan is worth trial.

Yours respectfully,
T. H. P.

MR. WALKER'S PUMP AND THE CENTRIFUGAL COMPARED.

SIR,—Mr. Walker's pump appears to be both ingenious and novel, but I am at a loss to perceive why it should be better, or so good as the *centrifugal pump*, which possesses, in my judgment, the following advantages over it.

1st. Although by overcoming the inertia of the pipes, &c. at the beginning and end of every stroke, there is not, from the nature of the crank, any loss of power, yet power must be wasted in friction from the pressure on the crank-shaft bearings, &c. in overcoming the inertia of the pipes and other parts twice in each stroke, and the inertia of the water in each pipe, once in each stroke. In the centrifugal pump, the motion of the pipe and arms, not being reciprocating, but continually rotary, there is is no strain or friction on any part of the machinery, to overcome their inertia and change the direction of motion.

2nd. The centrifugal pump is far more simple, as it has only one main pipe, the weight of which, with the water in it, rests in the best manner possible, on a pivot; besides this, there is no need of a fly-wheel, beam, three connecting rods, and frame-work, all which serve to render the machine bulky and unportable, increase the prime cost, and produce friction to some extent at least. Again, *celeris paribus*, the main pipes of Walker's pump must be much larger than that of the centrifugal pump, on account of the uninterrupted and more rapid flow of water through the latter.

A Walker's pump of the dimensions given in No. 971 of the *Mechanics' Magazine*, namely 30 ft. lift, interior diameter of pipes 3 inches, length of stroke 3 inches, rotation of crank say 300 times per minute,* with two pipes would, according to calculation, discharge 10¼ cubic

* It could not well be worked quicker, the strain on the crank, and for the most part on the other bearings, at 300 times per minute, would be about 7½ times the weight of the water in one pipe. Both the pipes themselves, with their connecting-rods and working beam, would at 600 times per minute be 30 times the weight of the above-mentioned parts.

feet of water per minute: (if the rotation of the crank were 227 times per minute no discharge would take place.)

Now with a centrifugal pump, having the same distance of lift 30 feet, and same discharge 10½ cubic feet of water per minute, with arms of 2 feet radius, and orifices at the ends 0·36 inch diameter, the interior diameter of its single main pipe need be less than 1¼ inch, and the rotation of the arms would be 600 times per minute, being the velocity at which only 3½ per cent. of the total power employed would be wasted, owing to the water having some velocity after quitting the arms; (if the rotation were 208 times per minute no discharge would take place.) In short, if this centrifugal pump had its orifices 0·8 inch, and its pipe of the same diameter as in the Walker's pump, it would, with proportionate power, perform five times the work, besides being simpler, as shown.

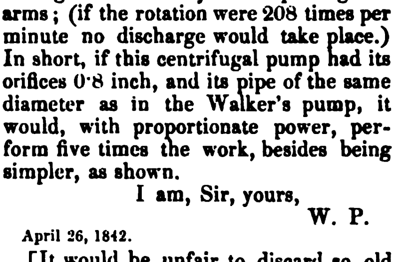
I am, Sir, yours,

W. P.

April 26, 1842.

[It would be unfair to discard so old and well-tried a friend, as "Centrifugal," without giving him a fair hearing; but we dare say Mr. Walker will have something to say in reply.—Ed. M. M.]

IMPROVED PLATE DIE FOR MAKING SCREWS.



Sir,—Having made an improvement in the plate-die for making screws, I send you a description of it, and should you think it worth notice, I shall feel obliged by your noticing it in your valuable work.

The hole must be made and tapped in the usual way, and then cut into the shape represented in the prefixed figure, leaving the thread full only at AA. I have made one, and I find that it cuts easier than any plate I ever used before. On the old plan the thread is formed more by compression than any thing else. On mine, it results naturally from the form of the die, and is produced without any difficulty. I remain, yours,

R. Hammond.

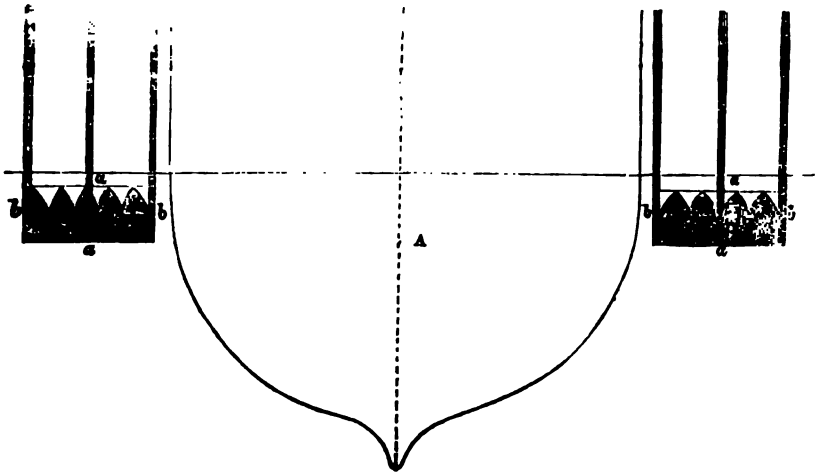
P.S. The writer of this is now out of employment. Any one desirous of the services of a person of good practical knowledge of mechanics, and accustomed to the vice and lathe, may address to R. H., 8, Southampton-terrace, Southampton-street, Pentonville.

ON THE TRUE PRINCIPLES OF VELOCITY IN STEAM NAVIGATION—BEING A SUPPLEMENT TO SPECIFICATION OF JOEST'S IMPROVEMENTS IN PROPELLING VESSELS (MECH. MAG. VOL. XXXV. P. 386. BY MR. A. W. BEYSE, ARCHITECT AND ENGINEER.

Whenever we shall arrive at that point where the speed of a steam vessel is equal to the velocity of the circumference of the paddle-wheels in the middle of the floats we shall have attained perfection. But it is obvious, that such perfection is unattainable in actual practice, and that all we can hope for is a near approximation to it. We must mark well the first beginning of the motion of a propelled steam-boat, and the moment when the power of the engines and the circumferential velocity of the wheels are in equilibrium, as also the resistance to propulsion offered by the vessel and floats. At first, every float drawn through the water acts with all its power, as a skull or oar, and the ship resists with all its power. But after the two forces have become equal, the striking float alone propels the vessel, and is but little assisted by the others, which are incumbered by back-water, work in broken water, and experience only the difference of resistance betwixt their own velocity and that of the fluid in which the steam boat moves. Again, the resistance of the vessel itself should also increase in the ratio of the square of its velocity, and so also the resistance of the floats drawn through the water; but this is not the case, because, after the vessel has attained a certain speed its resistance goes on in a decreasing proportion, and the floats find almost no resistance, because they escape before the broken water can detain them.

Let fig. 1 be the transverse section under the water line of a well-built steamer in its greatest width, where also the engines and paddle-wheels are placed; its keel and bow as sharp as the materials of which it is constructed will permit. The

Fig. 1.



bow, for instance, in an iron steam-boat, that is, the foremost part of the stem in the water should be as sharp as a knife, if possible; and then carried to the point A, in an angle which will make the hydraulic coefficient of resistance against the propulsion of the vessel as small as trial and experience have shown to be profitable. This coefficient is generally known by K, and has been found in moderate speeds of well-built vessels to be 0·2 of an unity,—in higher speeds only 0·15 of an unity. The surface of every single float of the paddle-wheels, dipped, or immersed at the same time in the water being A′, and the sum of them $\int A'$; the hydraulic coefficient of the resistance of a body in the shape, and of the size of a common paddle-float K′ has been established to be 2·5 unities. The equations for the two momentums of the engines with their speed of floats in the line *b b*, and the resistance of the immersed part A of the steamer together with its speed have been found by theory and practice to be*.

(I.) $v = \left(\sqrt{\dfrac{R\ A}{K'\int A'}} + 1\right)V.$ v being the velocity of the floats, and V the velocity or speed of the boat in still water.

(II.) In the navigation against, or with the stream, or the tides, this formula is changed to $v = \left(\sqrt{\dfrac{K\ A}{K'\int A'}} + 1\right)(V + u)$ against the current, u being the velocity of the water.

(III.) $v = \left(\sqrt{\dfrac{K\ A}{K'\int A'}} + 1\right)(V - u)$

with the current or the tides.

Now, if we would have the vessel run with the same speed as the floats of the paddle-wheels in the line *b b*, the equation I., must be brought to

$v = V.$ in still water, and the two other equations to

$v = V + u$

$v = V - u.$

As v is the velocity of the circumference of the wheel in the line *b b*, fig. 1, it is also evident, that a short stroke and a large diameter of the wheel are requisites for a great speed, to which the power must be in a true corresponding proportion. Now this can only be obtained by bringing the term

$\sqrt{\dfrac{K\ A}{K'\int A'}}$ to 0; or $v = (\sqrt{0} + 1)\,V$ etc.

However, K A being a positive quantity, the term K′ A′ must be infinite; or

$v = \left(\sqrt{\dfrac{K\ A}{\infty}} + 1\right) V$ etc. But as K′ is $= 2{\cdot}5$ unities, and A also a positive determined quantity, as well as $\int A'$, we desee that the speed of a vessel, and the velocity of the floats in the line *b b*, never can become equal by any human contrivance. However, this shows that we must have a great number of floats, in

* See Navier, Poncelet, and Taffe.

order to approach as much as possible to $\sqrt{\frac{\text{K A}}{\text{K}' \int \text{A}'}} = \sqrt{0}$.

It might appear as if a great number of floats would be the most advantageous, but then, we must look to back-water, and the circumstance that the striking floats at the moment they enter or dip in the water, find unbroken water to act upon; so that we may be convinced that floats much closer than at least 1 foot from each other in the circumference of the wheels, and then only with an appropriate shape, would probably not act favourably to the speed of the steamer.

These are the reasons which led me to the construction of Mr. Joest's patent paddle-wheels, in vertical, inclined, and horizontal positions, which have at least double the number of floats commonly used; I always considered loss of time before the floats strike, as a loss of speed and power. Since the specification of Mr. Joest's patent paddles, those eminent engineers, Messrs. Penn and Son, of Greenwich, have almost doubled the number of floats in their beautiful steamers, with oscillating engines, called the *Flirt* and *Coquette*. Many other vessels have had also the number of their floats increased.

It is also deserving of observation, that Messrs. Ditchburn and Mare, the well-known ship-builders of Blackwall, have shaped their fine vessels as much as possible to obtain the coefficient 0·2 or 0·15 of an unity in the resistance of the vessels against propulsion, and I think they are good authorities. Let us illustrate this by an example:

Let A in fig. 1 = 2,6 square metres (as French measure is known every where in Europe I follow it here,) the surface of each float be equal to $\frac{1}{3}$ or 0·33 square metres, and K equal, as stated before, to 0·2 of an unity. K′ 2·5 unities.

Now only to bring $\sqrt{\frac{\text{K A}}{\text{K}' \int \text{A}'}}$, to $\sqrt{\frac{2}{25}}$, we must have, A being equal to 2·6 metres square, $\int \text{A}' = 2{\cdot}6$

$\int \text{A}'$ or the surface of all floats immersed at the same moment = 2·6 = 2,60 square metres, which divided by 0·33, gives us the number of floats at the same time in the water equal to 7·9 or 8 in a round number, *i. e.* 4 in *each wheel*.

We will suppose a wheel of 12 feet 6 inches diameter; then the speed of the floats in the line *b b*, fig. 1, will be almost with 40 strokes of the engines in a minute $\frac{12 \times 3,14 \times 42}{60} = \frac{3,14 \times 42}{5} =$ 26,37 feet, or about 8 metres in a second, and consequently, the speed of the vessel 8 metres — $8\sqrt{\frac{2}{25}} = 8 - 8\sqrt{0,08} = 8 - 8{\cdot}0{\cdot}22. = 8 - 1,76$, or nearly = 6,24 metres. Or when the floats have in the line *b b* a velocity of 20 miles an hour, the vessel will only have a speed of 15 or 16 miles an hour, which is in accordance with actual practice.

Now the diameter of the paddle-wheels remaining 12 feet 6 inches, the circumference in the line *bb*, fig. 1 is = 12 × 3,14 = 37,68 feet, and the number of floats in one wheel being 4 in the water, we have for the number of floats in one wheel 4 × 8 = 32. But if we will have the vessel going with a higher speed, we must bring the quantity $\sqrt{\frac{\text{K A}}{\text{K}' \int \text{A}'}}$ to a smaller fraction, or make $x = 2 \times 2,6 = 5,2$ etc.

In this case $\sqrt{\frac{\text{K A}}{\text{K}' \int \text{A}'}}$ would be = $\sqrt{\frac{1}{25}}$ etc.

Further we have $\frac{37,68}{32} = 1,18$ foot, or thereabouts, = 1 foot 2 inches asd istance for the floats in the wheels. In the last case the floats would only be distant from each other 7 inches. and we could scarcely get rid of back water, or make each float strike upon unbroken water entering it. But it is easy to find by trials the maximum and minimum of the best effectual number of floats.

When we consider all that has been said and calculated, we find that long floats, which possess the hydraulic coefficient K′ = 2·5 unities, must be the very best; but the length of the floats is limited by the beam of the vessel, its stiffness, etc.

We will now examine the steam-engine power requisite for fast-running steam-vessels.

Let V represent the speed of the boat, and v speed of the floats in the line *bb*.

The resistance of the vessel against propulsion in still water must then be (Navier) nearly

$$51\ K\ A\left(\sqrt{\frac{K\ A}{K'fA'}} \times 1\right)V^2;$$

and as the load of the engines must be equal to their power, multiplied by the speed of the floats, we have the equation (P being the power in kilogrammetres)

$$P\ v + 51\ K\ A\left(\sqrt{\frac{K\ A}{K'fA'}} \times 1\right)V^2$$

Or, as in our foregoing example,

$\sqrt{\frac{K\ A}{K'fA'}} \times 1$ being reduced to $\sqrt{\frac{2}{25}}$ $\times\ 1 = \sqrt{0{,}08} \times 1 = 1{,}3$ or thereabouts.

$Pv = 51 \times 0{,}2 \times 2{,}6 \times 1{,}3 \times V^2$; and as v is found equal to 1,28 V in our former illustration we have

$P.\ 1{,}28\ V = 51 \times 0{,}2 \times 2{,}6 \times 1{,}3 \times V^2.$

$P.\ 1{,}28 = 51 \times 0{,}2 \times 2{,}6 \times 1{,}3 \times V^2.$

Or, as 1,28 and 1,3 are almost equal, $P = 51 \times 0{,}2 \times 2{,}6 \times V^2$ and V being $= 8$, we have

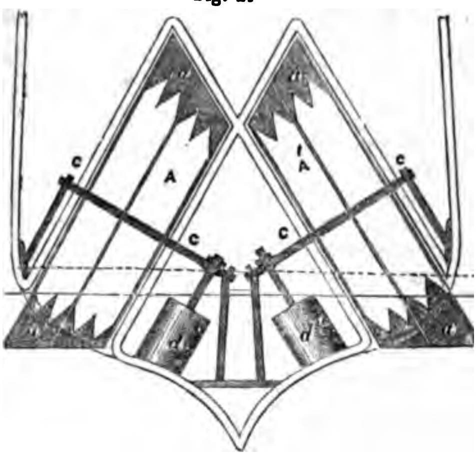
$P = 51 \times 0{,}52 \times 64$ kilogrammetres, Or as 75 kilogrammetres are equal to one horse power in steam engines,

$$\text{Horse-power} = \frac{P}{75} = \frac{51 \times 0{,}52 \times 64}{75}$$

$= \frac{17}{25} \times 0{,}52 \times 64 = 0{,}68 \times 0{,}52 \times 64$ $= 22,\ 63$ horse-power, which should propel a well-built vessel with the requisite number of floats, at the calculated speed of fifteen miles an hour. But as small boats having 20 to 24 horse-power are not yet constructed so perfectly that the hydraulic coefficient K is brought down in their resistance against propulsion, to 0·20, or 0·15 of an unity, these vessels do not run so fast as those which have 30 to 32 horse power, where a good deal of power is also lost by friction, resistance of air, and back-water. The river steamers may, by working out these principles, advance to perfection in some few years, and paddle-wheels will always be their best propellers; but as for canal-boats, (which certainly cause less working of the slopes when propelled with paddles of a great number of narrow floats, than with ordinary paddle-wheels, so that, for instance, with floats in a canal-boat the destruction of the slopes might almost cease;) and in sea-faring steam-vessels it is desirable to have other propellers than paddle-wheels, as well for safety as speed.

For sea-faring vessels and canal-boats I propose paddle-wheels A A (see fig 2) to be placed in an oblique position, and provided with floats *a a a a*, according to Mr. Joest's patent, or even ordinary floats, so numerous, and so shaped that they shall always experience equal resistance in the water after their dips, and the weight, which acts more upon the bearings *b b*, than on those *c c*. This is the reason for the conical shape given to the paddle-wheels. Each wheel A A′ has its own engine, with two inclined cylinders *d d* and *d′ d′*, and in case of low-pressure engines with condenser and air-pump attached to it. But though there must also be more separate boilers for large vessels, the steam must have one general communication, so that the engines may work with the same power upon each of the paddle-wheels. Now both the paddle-wheels may be worked together forwards or backwards, or one alone may work forwards or backwards, and the other be stopped, or one may work ahead and the other astern, so that you can turn the vessel around one point. These paddle-wheels will do well for men of war steamers, as every competent judge may see. The great velocity with which screws, horizontal wheels, and propellers of every description must be worked, is not requisite here, because the wheels within the vessel may be as wide as ordinary wheels, and have the same medium diameter. All these are certainly great advantages in sea-faring and canal steamers.

Fig. 2.



A. W. Beyse.

3, Bengal-terrace, April 6, 1842.

STATE OF LABOUR IN THE COAL, IRON, TIN, COPPER, LEAD AND ZINK MINES OF GREAT BRITAIN AND IRELAND, AND IN THE SURFACE WORKS FOR REDUCING THE ORES OF THESE METALS.

[Compiled from the First Report of the Children's Employment Commission, 1842.]

I.—COAL MINES.

The "Coal Measures," as the geological formations comprising the strata of coal are designated, are variously dispersed in the midland, northern, and western portions of South Britain, and in a broad belt of country which traverses the centre of Scotland, from the shores of Ayrshire to those of the Frith of Forth.

The most important of the English midland coal tracts, or coal fields, is that of South Staffordshire, which, lying to the west and north of Birmingham, is remarkable for the extent to which its vast beds are worked, as well for the purpose of smelting the iron ores, which are raised from strata interspersed among the coal strata, as for the consumption of the neighbouring populous towns, which are the seat of the metal manufactures, and for an extensive "land sale,"—as the supply of the surrounding country with fuel is frequently designated; the country southward, where canals extend, as far as the Thames, being in great part supplied from this region. The Shropshire district of Coalbrookdale, lying midway between Wolverhampton and Shrewsbury, though much smaller in extent, is in like manner the seat of great iron works, and is the source of a supply of fuel for a great part of the vale of the Severn, and the country to the west of it, to the borders of Wales. The Warwickshire coal field occupies a large tract on the north-eastern verge of that county, from Coventry to Tamworth; and the Leicestershire coal field surrounds the town of Ashby-de-la Zouch. The coal of the latter is far more extensively wrought than that of the Warwickshire field; but both being without iron furnaces, their produce is required only for the land sale, which extends southward even through Buckinghamshire to the Thames.

In North Staffordshire, besides the coal field of the potteries, in which there are extensive ironworks at Kidscrew, there is a smaller tract contiguous to the town of Cheadle. The consumption of the produce of both, however, extends little beyond the northern parts of that county.

In the vale of the Trent, between Nottingham and Derby, commences the great coal-field of Derbyshire and Yorkshire, which extends hence northward, and of which the southern, or Derbyshire portion, occupies the eastern side of that county, and extends at one extremity into Nottinghamshire. Besides supplying with fuel a vast surrounding region, especially to the east and south, in the counties of Leicester, Nottingham, and Lincoln, it has a considerable home consumption in iron-works. The northern, or Yorkshire portion, which is wholly comprised in the West Riding, has extensive iron-works, and supplies with fuel the whole of Yorkshire, except the coast, and even makes some shipments down the Humber for London.

On the opposite side of the mountains which enclose Yorkshire on the west are the great coal-fields of Lancashire, extending southward into the eastern part of Cheshire, and worked to an enormous extent for the supply of the manufactures and the manufacturing and commercial population which have congregated in their neighbourhood and upon their surface, although there is no manufacture of iron native ores.

North of this is the Cumberland coal-field, in which likewise the pits are wrought only for sale, to supply the counties of Cumberland and Westmoreland, and for shipment, chiefly at Whitehaven, to Ireland and the opposite shores of Scotland.

Again crossing the mountains to the eastern side of the island, we find a large portion of the counties of Durham and Northumberland occupied by the coal tract, which, of all the districts having pits wrought almost wholly for sale, and only to a very small extent for the manufacture of metals, is by far the most important. It supplies not only the whole of those counties, the North Riding of Yorkshire, and the contiguous Scottish counties, but the whole of the eastern and southern coasts of England as far as Cornwall, including the metropolis itself, and the great south-eastern region, into which the sales of the inland coal-districts do not penetrate, because of the greater cost of land-carriage and the want of canals. The export to foreign parts is likewise very extensive; and the whole region is so important as to have rendered necessary, for the purposes of investigation, its division into two districts; that of South Durham, south of the river Wear, and that of North Durham and Northumberland, comprising the rest of the field.

The Coal Districts of the East of Scotland encircle the Firth of Forth in tracts of very irregular form, occupying large portions of the counties of East Lothian, Mid-Lo-

thian and West Lothian, of Stirlingshire, and part of Dumbartonshire, of Clackmannanshire and Perthshire; and of Fifeshire, in the districts of Dunfermline, Kirkaldy, Cupar, and St. Andrews; the coal of the whole of these districts is extensively wrought, chiefly for land sale to Edinburgh and the surrounding counties, though partly for shipment coastwise, and for the celebrated iron-works of the Carron Company in Stirlingshire.

Lanarkshire, Ayrshire, and Renfrewshire comprise nearly the whole of the irregularly scattered coal-fields of the West of Scotland, and their mines have been chiefly wrought, like those of Lancashire, for the supply of the manufacturers, and of the great manufacturing and commercial population which have seated themselves upon their surface, or in their vicinity, with Glasgow for a centre; but of late years the district of Airdrie, to the east and south-east of Glasgow, has so rapidly extended its importance in the manufacture of iron from the excellent ores there found, as greatly to have augmented the working of its coal for that purpose also.

Returning southward, we find, on the eastern border of North Wales, in the counties of Denbigh and Flint, where they border upon Cheshire, a large coal-field, heretofore possessed of considerable iron-works, which, however, seem now to be sinking before the competition of those in the West of Scotland, and other districts: it still, however, supplies with fuel nearly the whole of North Wales, and a large portion of Cheshire and Shropshire.

But the greatest coal-basin of the West is that of South Wales, which, commencing in the politically English county of Monmouth, occupies a considerable portion also of the counties of Glamorgan, Carmarthen, and Pembroke. The internal consumption of its coal in the manufacture of its native ores of iron, and of those of copper and tin brought from Cornwall and other parts, is enormous; and besides supplying with fuel the whole of south Wales and its borders, Cornwall, and a considerable part of Somersetshire, it exports large quantities of stone coal, even to London.

The Forest of Dean is a singular detached coal field in Gloucestershire, between the confluent rivers Wye and Severn, in which pits are wrought for the manufacture of its excellent iron ores, and for the supply not only of the contiguous parts of Herefordshire and Gloucestershire, but also for a considerable land sale eastward towards Oxford. South Gloucestershire is, in great part, occupied by a coal field which extends northward from Bristol, and supplies that city and the contiguous country with fuel.

It is for a similar land sale that the valuable mines of north Somersetshire, on the other side of the Avon, are wrought; the principal being those to the south-west of Bath, which not only supply the contiguous country, but have an extensive sale eastward in Wiltshire and Berkshire.

Of the comparatively unimportant coal-fields of Ireland, the principal are those of Castlecomer in Kilkenny and the Queen's County, where pits are worked for country sale by three proprietors; that near Killenaule, in the county of Tipperary, where there are three pits worked by the Mining Company of Ireland; and that of Dromagh and Dysart, in the county of Cork, where there are pits worked by Messrs. Leader. There are also a few pits at Drumglass and Coal Island, in the county of Tyrone, which, with the Arigna coal pits at the northern extremity of Roscommon, supplying some contiguous iron works, complete the list of the Irish coal mines which are now worked.

From a great mass of evidence collected, respecting the practices of these various collieries, the Commissioners have been led to the following conclusions:—

1. That instances occur in which children are taken into these mines to work as early as four years of age, sometimes at five, and between five and six, not unfrequently between six and seven, and often from seven to eight, while from eight to nine is the ordinary age at which employment in these mines commences.

2. That a very large proportion of the persons employed in carrying on the work of these mines is under thirteen years of age; and a still larger proportion between thirteen and eighteen.

3. That in several districts female children begin to work in these mines at the same early ages as the males.

4. That the great body of the children and young persons employed in these mines are of the families of the adult workpeople engaged in the pits, or belong to the poorest population in the neighbourhood, and are hired and paid in some districts by the work-people, but in others by the proprietors or contractors.

5. That there are in some districts also a small number of parish apprentices, who are bound to serve their masters until twenty-one years of age, in an employment in which there is nothing deserving the name of skill to be acquired, under circumstances of frequent ill-treatment, and under the oppressive condition that they shall receive only food and clothing, while their free companions may be obtaining a man's wages.

6. That in many instances much that skill and capital can effect to render the place of work unoppressive, healthy, and safe, is done, often with complete success, as far as regards the healthfulness and comfort of the mines; but that to render them perfectly safe does not appear to be practicable by any means yet known; while in great numbers of instances their condition in regard both to ventilation and drainage is lamentably defective.

7. That the nature of the employment which is assigned to the youngest children, generally that of "trapping," requires that they should be in the pit as soon as the work of the day commences, and according to the present system that they should not leave the pit before the work of the day is at an end.

8. That although this employment scarcely deserves the name of labour, yet, as the children engaged in it are commonly excluded from light and are always without companions, it would, were it not for the passing and repassing of the coal carriages, amount to solitary confinement of the worst order.

9. That in those districts in which the seams of coal are so thick that horses go direct to the workings, or in which the side passages from the workings to the horseways are not of any great length, the lights in the main ways render the situation of these children comparatively less cheerless, dull, and stupifying; but that in some districts they remain in solitude and darkness during the whole time they are in the pit, and, according to their own account, many of them never see the light of day for weeks together during the greater part of the winter season, excepting on those days in the week when work is not going on, and on the Sundays.

10. That at different ages, from six years old and upwards, the hard work of pushing and dragging the carriages of coal from the workings to the main ways, or to the foot of the shaft, begins; a labour which all classes of witnesses concur in stating requires the unremitting exertion of all the physical power which the young workers possess.

11. That, in the districts in which females are taken down into the coal mines, both sexes are employed together in precisely the same kind of labour, and work for the same number of hours; that the girls and boys, and the young men and young women, and even married women and women with child, commonly work almost naked, and the men, in many mines, quite naked; and that all classes of witnesses bear testimony to the demoralizing influence of the employment of females underground.

12. That, in the east of Scotland, a much larger proportion of children and young persons are employed in these mines than in other districts, many of whom are girls; and that the chief part of their labour consists in carrying the coals on their backs up steep ladders.

13. That when the workpeople are in full employment, the regular hours of work for children and young persons are rarely less than eleven; more often they are twelve; in some districts they are thirteen; and in one district they are generally fourteen and upwards.

14. That in the great majority of these mines night-work is a part of the ordinary system of labour, more or less regularly carried on according to the demand for coals, and one which the whole body of evidence shows to act most injuriously both on the physical and moral condition of the workpeople, and more especially on that of the children and young persons.

15. That the labour performed daily for this number of hours, though it cannot strictly be said to be continuous, because, from the nature of the employment, intervals of a few minutes necessarily occur during which the muscles are not in active exertion, is nevertheless generally uninterrupted by any regular time set apart for rest and refreshment; what food is taken in the pit being eaten as best it may while the labour continues.

16. That in well-regulated mines, in which in general the hours of work are the shortest, and in some few of which from half an hour to an hour is regularly set apart for meals, little or no fatigue is complained of after an ordinary day's work, when the children are ten years old and upwards; but in other instances great complaint is made of the feeling of fatigue, and the workpeople are never without this feeling, often in an extremely painful degree.

17. That in many cases the children and young persons have little cause to complain in regard to the treatment they receive from the persons in authority in the mine, or from the colliers; but that in general the younger children are roughly used by their older companions; while in many mines the conduct of the adult colliers to the children and young persons who assist them, is harsh and cruel; the persons in authority in these mines, who must be cognizant of this ill-usage, never interfering to prevent it, and some of them distinctly stating that they do not conceive that they have any right to do so.

18. That, with some exceptions, little interest is taken by the coal owners in the children and young persons employed in their works, after the daily labour is over;

at least little is done to afford them the means of enjoying innocent amusement and healthful recreation.

19. That in all coal-fields accidents of a fearful nature are extremely frequent; and that the returns made to our own queries, as well as the registry tables, prove that of the workpeople who perish by such accidents, the proportion of children and young persons sometimes equals and rarely falls much below that of adults.

20. That one of the most frequent causes of accidents in these mines is the want of superintendence, by overlookers or otherwise, to see to the security of the machinery for letting down and bringing up the workpeople, the restriction of the number of persons that ascend and descend at a time, the state of the mine as to the quantity of noxious gas in it, the efficiency of the ventilation, the exactness with which the air-door keepers perform their duty, the places into which it is safe or unsafe to go with a naked lighted candle, and the security of the proppings to uphold the roof, &c.

21. That another frequent cause of fatal accidents in coal mines is the almost universal practice of intrusting the closing of the air-doors to very young children.

22. That there are many mines in which the most ordinary precautions to guard against accidents are neglected, and in which no money appears to be expended with a view to secure the safety, much less the comfort, of the workpeople.

23. That there are moreover two practices peculiar to a few districts which deserve the highest reprobation; namely, first, the practice, not unknown in some of the smaller mines in Yorkshire, and common in Lancashire, of employing ropes that are unsafe for letting down and drawing up the workpeople; and, second, the practice, occasionally met with in Yorkshire, and common in Derbyshire and Lancashire, of employing boys at the steam-engines for letting down and drawing up the workpeople.

24. That in general the children and young persons who work in these mines have sufficient food, and, when above ground, decent and comfortable clothing, their usually high rate of wages securing to them these advantages; but in many cases, more especially in some parts of Yorkshire, in Derbyshire, in South Gloucestershire, and and very generally in the East of Scotland, the food is poor in quality, and insufficient in quantity; the children themselves say that they have not enough to eat; and the Sub-Commissioners describe them as covered with rags, and state that the common excuse they make for confining themselves *to their homes on the Sundays*, instead of taking recreation in the fresh air, or attending a place of worship, is that they have no clothes to go in; so that in these cases, notwithstanding the intense labour performed by these children, they do not procure even sufficient food and raiment: in general, however, the children who are in this unhappy case are the children of idle and dissolute parents, who spend the hard-earned wages of their offspring at the public-house.

25. That the employment in these mines commonly produces, in the first instance, an extraordinary degree of muscular development, accompanied by a corresponding degree of muscular strength: this preternatural development and strength being acquired at the expense of the other organs, as is shown by the general stunted growth of the body.

26. That partly by the severity of the labour and the long hours of work, and partly through the unhealthy state of the place of work, this employment, as at present carried on in all the districts, deteriorates the physical constitution; in the thin-seam mines, more especially, the limbs become crippled and the body distorted; and in general the muscular powers give way, and the workpeople are incapable of following their occupation, at an earlier period of life than is common in other branches of industry.

27. That by the same causes the seeds of painful and mortal diseases are very often sown in childhood and youth; these, slowly but steadily developing themselves, assume a formidable character between the ages of thirty and forty; and each generation of this class of the population is commonly extinct soon after fifty.

The Commissioners have, notwithstanding the preceding conclusions, felt bound to report upon the whole:

First. That the coal mine, when properly ventilated and drained, and when both the main and the side passages are of tolerable height, is not only not unhealthy, but, the temperature being moderate and very uniform, it is, considered as a place of work, more salubrious and even agreeable than that in which many kinds of labour are carried on above ground.

Second. That the labour in which children and young persons are chiefly employed in coal mines, namely, in pushing the loaded carriages of coals from the workings to the mainways or to the foot of the shaft, so far from being in itself an unhealthy employment, is a description of exercise which, while it greatly develops the muscles of the arms, shoulders, chest, back, and legs, without confining any part of the body in an

unnatural and constrained posture, might, but for the abuse of it, afford an equally healthful excitement to all the other organs; the physical injuries produced by it, as it is at present carried on, independently of those which are caused by imperfect ventilation and drainage, being chiefly attributable to the early age at which it commences, and to the length of time during which it is continued.

When we consider the extent of this branch of industry, the vast amount of capital embarked in it, and the intimate connexion in which it stands with almost all the other great branches of our trade and manufacture, these conclusions are of a very consoling and satisfactory character.

One intolerable case there is, however, for which the Commissioners seem to admit there is no remedy but entire abolition.

By the evidence collected under this Commission, it is proved that there are coal mines at present in work in which these passages are so small, that even the youngest children cannot move along them without crawling on their hands and feet, in which unnatural and constrained posture they drag the loaded carriages after them; and yet, as it is impossible, by any outlay compatible with a profitable return, to render such coal mines, happily not numerous nor of great extent, fit for human beings to work in, they never will be placed in such a condition, and consequently they never can be worked without inflicting great and irreparable injury on the health of the children.

II.—IRON MINES AND WORKS.

The characteristic differences between the ironstone mines and the coal mines, as far as those differences influence the manner of working the former, are chiefly these:

In the ironstone mines the beds are, for the most part, thin, generally from two to three feet, a little more or less. In many of these pits the ore is in thin bands of two or three inches in width, and very often two thin beds lie near each other, with a substratum of indurated clay beneath them. The miners have only the space between the bands to work in; or if they clear away some space more, it is the smallest possible, on account of the expense. The ironstone found in the form of rounded boulders is *distributed through* strata of clay, or of clay and sand; and in this case more room is usually afforded for work.

The Commissioners report with regard to labour in these mines—

That on account of the greater weight of the material to be removed, the labour in these mines, which are worked on a system similar to that of the coal mines, is still more severe than that in the latter, and renders the employment of older and stronger children a matter of absolute necessity; while the ironstone pits are in general less perfectly ventilated and drained than the coal mines, and are, therefore, still more unhealthy, producing the same physical deterioration and the same diseases, but in a more intense degree.

And in regard to the blast furnaces for reducing the ores of iron, they find—

That the operations connected with these works involve the absolute necessity of night work; that children and young persons invariably work at night with the adults; that the universal practice is for one set of workpeople to work one week during the day, and the same set to work the following week during the night; and that there is, moreover, in addition to the evil of alternate weeks of night work, a custom bearing with extreme hardship upon children and young persons, namely, that of continuing the work without any interruption whatever during the Sunday, and thus rendering every alternate Sunday the day during which the labour of one set of workpeople is continued for twenty-four hours in succession; a custom which still prevails, notwithstanding that a considerable proportion of the proprietors have dispensed with the attendance of the workpeople during a certain number of hours on the Sunday, without disadvantage to their works.

The necessity of Sunday labour to a large extent at the blast furnaces, is thus explained by Mr. Lane, one of the superintendants of the Colebrook Dale Company.

For these twelve years past the furnaces have stood six hours on the Sundays, and sometimes a little longer. No injury arises if the furnace be at the time in a good working state; but if not in a good working state, or if it was to stand too long, the iron would be thick and hard, and would fall into the hearth and set; that is, it would congeal and pass from a fluid into a solid state, and, consequently, when the time came for tapping the furnace to let out the melted iron, it would be necessary to make the opening higher up to let out the fluid iron, and it would be, perhaps, three weeks before all the

ed iron came off by little and little, and the furnace. If the furnace were to)r ten or twelve hours, at the end of ıe it would not be in so good a state, it ıot make so good iron, and it would reater expense; there would be more nsumed, and there would be more and less iron, and that not so good ity. When an accident happened by he furnace was stopped twenty-four it was from a week to nine days be- furnace was set right.... Has known where, from an accident, the furnace pped eight hours, the furnace was not l working order after it commenced, ras not right until the third day. He quently known the furnaces in worse on from stopping the usual six hours days.

IN, COPPER, LEAD, AND, ZINK MINES.

employment of children and young s in the mines of tin, copper, lead, ık, has little in common with their ment in mines of coal and iron, on t of the different physical circum- in which the ores of these metals are and the peculiar operations required rate them from the worthless mate- ith which they are combined.

ead of forming beds more or less hori- and in regular alternation with strata ch the material is for the most part removed by the tools of the work- hese ores are found in veins which ly approach a vertical position, in the cks of the primary formations, or in rcely less solid lower beds of the car- ous system.

ores of tin are found only in the ı district, in granitic and slaty rocks, ous structure, which are interspersed nally with masses of trap, and ex- om Dartmoor, in Devonshire, to the End, in Cornwall. This district is e most productive in copper ores of the British Islands, and contains, er, mines of manganese, of iron, and , the ores of which latter often con- portion of silver, which is worth ex- g from the baser metal. Of the va- nines of this district, those of tin, , and lead present the characteristic s of its mining labour, and employ t nineteen-twentieths of the young engaged in it. The ores here ob- are smelted chiefly in South Wales, shipped to Swansea for the conveni- f fuel; but in the other principal districts the ores are smelted near ce of their excavation.

elevated district of mountain lime-stone, intermingled with various strata of gritstone and shale, which occupies the borders of Northumberland, Durham, and Cumberland, and of which Alston Moor may be considered as the capital, is the only other part of England in which metallic veins are now extensively wrought: these are exclusively of lead, containing a proportion of silver, which is commonly worth extracting. The veins in the mountain limestone of Derbyshire are now nearly exhausted.

In Wales, the Plinlimmon district, composed of various qualities of slate, was formerly much celebrated for its metallic products, but is now of inferior importance, and has not been subjected to any special investigation under the terms of the present commission. In the neighbourhood of Snowdon the scattered mines are also of inferior importance. But the mines in the mountain limestone of Flintshire present an important group of works, into which the inquiry has been extended.

In Scotland the principal metallic veins that have yet been worked are still those in the clay slate mountains in the neighbourhood of Leadhills, on the borders of Lanarkshire and Dumfries-shire, although trials are also making in various parts of Galloway, and one of them, at Carsephairn, is on a considerable scale.

In Ireland, in the slate and limestone rocks of the most mountainous districts, and generally near the sea-coast, there are scattered some mines of copper and lead, but chiefly of copper, for the most part in the counties of Wicklow, Wexford, Waterford, Cork, Kerry, Tipperary, Down, and Armagh.

Most of the regions in which the metallic veins occur, are thus seen to be hilly or mountainous. The south-western and the Flintshire districts are the least elevated; the loftiest hills in the former rarely exceeding 1,000 feet above the level of the sea, while the greater number of them range from 500 to 700, and the plains at their bases are in general but from 100 to 200 feet above high water. This circumstance materially affects the comfort of the children and young persons employed in working the mines.

With respect to the under ground labour in these mines, the Commissioners report—

1. That very few children are employed in any kind of underground work in these mines before they are twelve years old, and that in many cases even the young men do not commence underground work until they are eighteen years of age and upwards.

2. That there is no instance in the whole kingdom of any girl or woman being employed in underground work in these mines.

3. That it is in the Cornish district alone

that children and young persons of any age are constantly employed underground in considerable numbers.

4. That, in general, the children and young persons employed in these mines have sufficient food, and decent and comfortable clothing.

5. That employment in these mines, does not, in general, produce any apparent injury to the young worker during the period of boyhood and adolescence, but that his employment is essentially, and in every mode in which it has hitherto been carried on, necessarily injurious in after life.

6. That the very general and early deterioration and failure of the health and strength of those who have followed this occupation from boyhood and youth, is increased by certain circumstances which are not necessarily connected with the nature of the employment; among these may be reckoned the practice, almost universal in these mines, of associating the young persons in partnership with the adult miners, by which the former are stimulated to exertions greatly beyond their age and powers; and though these young people, thus excited, work with spirit, and without apparent injury, for some time, yet in a few years it is proved by experience that they have expended the whole capital of their constitution.

7. That this result is materially hastened by the fatigue of climbing the ladders; these being, with few exceptions, the only means by which the miners can go to and return from their places of work.

8. That these, however, are only the accessory causes of the general and rapid deterioration of the health and strength of the miners; since the primary and ever active agent which principally produces this result is the noxious air of the places in which the work is carried on; the difficulties connected with the purification and renovation of this air, and with the whole subject of ventilation, being incomparably greater in the mines in question than in coal mines.

9. That the ultimate effect of the disadvantageous circumstances under which the miner is obliged to pursue his laborious occupation, is the production of certain diseases (seated chiefly in the organs of respiration), by which he is rendered incapable of following his work, and by which his existence is terminated at an earlier period than is common in other branches of industry, not excepting even that of the collier.

With regard to the surface employments connected with dressing the ores of tin, copper, lead, and zink, the Commissioners find—

That these employments, though entered into at very early ages, and in the Cornish district by great numbers of girls as well as boys, are wholly free from the evils connected with the underground work; that, with the exception of a very injurious exposure to the inclemency of the weather, which might be obviated by a small expenditure in providing shelter, and with the exception of two or three occupations, such as those of "bucking" and "jigging," for the manual labour of which the substitution of machinery is gradually taking place, there is nothing in this branch of mining industry injurious, oppressive, or incompatible with the maintenance even of robust health, which indeed is described as the general condition of the workpeople; the children and young persons thus employed having commonly sufficient food, and warm and decent clothing, being subjected to no harsh or tyrannical treatment, and enjoying an almost complete immunity from any serious danger.

Dr. Barham, one of the Sub-Commissioners, states that an experiment of lowering and raising the miners by machinery has lately been, for the first time, made in Cornwall, at the great copper mine Tresavean, in Gwennap. The method adopted has been very little varied from that long in use in the mines in the Hartz in Germany, being that of two parallel rods, with stages projecting from them at intervals of about 12 feet, of a convenient size for one man to stand upon. One rod being made to descend while the other ascends, the miner steps from his stage or platform on one rod to that which he finds opposite to it on the other rod, and by this alternate change he is conveyed up or down the shaft without any other exertion. The moving power to which the rods are attached is at present a water wheel. This experiment, which has been perfectly successful, has been carried into effect by the spirited and benevolent exertions of the principal lords and adventurers of Tresavean, stimulated and aided by the Royal Polytechnic Society of Cornwall.

The Commissioners reserve for a future Report the subject of Tin Works; but report with respect to the others, that in smelting the ores of lead, near the places at which they are raised, no children, and very few young persons, are engaged, but that in the copper works of South Wales, in which the Cornish ores are smelted, and in those of North Wales, which reduce the ores raised in their vicinity, a number of children and young persons are employed, from nine years of age and upwards (in South Wales girls as well as boys), of whom those engaged at the calcining furnaces regularly work with the men twenty-four hours consecutively, or alternate days, without excepting the Sunday; a term of work which is

sometimes extended to thirty-six hours, and even to forty-eight hours, when, as in South Wales, the "long watch" includes the Sunday.

The Sub-Commissioner who reports on the South Staffordshire and Shropshire districts is of opinion that there is no necessity whatever for working the calcining furnaces on Sundays.

"At many works all the furnaces, including the calciners, are on Sundays suspended from *active operations*, and simply kept on "deadfire," as it is termed, attended only by watchmen, one of whom generally serves two or more of such fires, until the hands resume their regular work on the Sunday night or Monday morning. In my own opinion, very little is actually required to be done on Sunday in order to keep the copper-works in action, and none, of necessity, on the parts of children, young persons, or females."

THE PARIS RAILWAY ACCIDENT—HOW OCCASIONED—PRACTICE AND PRACTICIANS *versus* MATHEMATICS AND MATHEMATICIANS—SCHOOL FOR ENGINE-DRIVERS. BY BENJAMIN CHEVERTON, ESQ.

Sir,—It is a fearful thing, although perhaps necessarily consequent on the terrific powers which man has undertaken to use and control, that we are destined to acquire such useful knowledge in respect to safe railway conveyance, only at a tremendous cost of human suffering; but it is a monstrous and a cruel thing, that only through such a medium can men's minds be sufficiently impressed to arouse them to seek and adopt all possible precautions against the reourrence of those accidents by which it has been produced. To rely on science and scientific men in these matters is a dangerous fallacy. What is wanted is, a power to imagine and provide against all conceivable combinations of events out of which accidents can arise; but they frequently result from a concurrence of minute or apparently trivial circumstances, far removed from the meagre generalities of science, and more within the scan of, and the probability of suggestion, to the practical minds of the men engaged in the occupation. I would, indeed, give greater attention to the statements even of the drivers and stokers of the engines, however illiterate they may be, if shrewd and observant men, than I would to those of the most accomplished mathematician. I am not aware that the official report of the accident on the Brighton railway, occasioned by a four wheel engine running off the rails, threw any particular light on the cause of the unsteadiness of the engine on that occasion; but I know very well that the remarks made by the engine-driver at the Coroner's Inquest, were well deserving attention. I am inclined to think that there is a greater outcry against four-wheel engines than they altogether deserve, although upon the whole, the six-wheel arrangement may be much the best.

There are not wanting, however, practically-minded men of a higher class than engine drivers, who are sufficiently conversant with the technicalities of the subject, and whose opinions and suggestions ought to meet with greater attention from Directors of Companies, than it is in general their fate to receive. But the practice is, in the case of an accident, to send a scientific man to *report* on the affair, and there the matter ends. In that most appalling and awful calamity on the Paris and Versailles railway, the Academy of Sciences sent two of their members* to investigate and report on the subject, and what have they done? We are just as ignorant of the real cause of the accident as we were before. They have pointed out for reprehension, practices which have often and often been reprehended before, and but for which, the destruction of life would probably have been much less than it was; but the mystery of the breaking of the axle is not cleared up, and for aught that appears was not even investigated.

It seems, from the accounts which have been published, that Mr. George and M. Milhan, the *General* Engineer and the Inspector, were apprehensive from the faulty arrangements, that an accident might happen, and thought it necessary to be themselves with the engines to conduct them. So much were they on the alert, that M. Milhan, seeing something that he thought amiss, sounded his alarm whistle to draw Mr. George's attention, who instantly had recourse to his break, and as instantly was the axle

* These gentlemen appear also to fill some official situations connected with the inspection of roads and railways,—gentlemen, no doubt, of very respectable scientific acquirements.

broken "*on each side.*" This was not, nor was it likely to have been, a case of weakness from wear and tear; neither did it result from a flaw in the axle, for it is stated to have been perfectly sound, both the iron and the manufacture being excellent. It is not to be supposed that the axle was wanting in the usual proportion of strength; besides, it must often have been tested in this manner. What, then, caused it to break? There evidently must have been a peculiar concurrence of circumstances which put an unusual stress upon it. What were those circumstances? A light locomotive was in advance; a ponderous one was immediately behind; a huge train of carriages was in the rear; they were going down an incline, going, it is said, at a great velocity, passing over a road, and passing also round a curve of too short a radius, it is to be feared. Under these circumstances, the conductor for the time being, sensitively alive to danger, and unfitted to display probably his usual coolness and presence of mind, and unaccustomed to the task, hastily and suddenly uses the break, and the accident instantly happens.

If the axle broken on this occasion was connected with the break, of which there is every probability, this conduct of Mr. George must have been the primary and fatal error, although no doubt the other circumstances were accessory, to an unusual stress having on this occasion been put upon the axle. The curve on the railroad, for instance, must have added a lateral strain; the vibration produced by crossing the road, if it exactly coincided with the *application* of the break, must have increased the tendency to a fracture; and the greater velocity induced by descending the incline, must have augmented the stress in a percussive point of view. Yet there was nothing in these circumstances of an unusual character, taken either singly or combined; for the incline, the curve, and the crossing of the road, are connected localities, and the increased velocity was a necessary consequence of the incline, so that the concurrence of these circumstances must be constant and unavoidable; and doubtless it was quite the ordinary practice to apply the break at this part of the line. Such application, however, would be under peculiar if not unusual circumstances, and at a time when the strain on the axle *would be the greatest*; any additional circumstances, therefore, combined on this occasion, must be just the one thing more that caused it to fail; and that is to be found only in the *mode* of handling the break; for as to the second engine, and the great length of the train, they are circumstances which do not bear upon the point.

The more than ordinary amount of momentum to be checked by the action of the break, does not add to the straining or breaking force operating on the axle, for that is equal only to the force of resistance, which, through the break, opposes the mass in motion; which again is equal to the friction of the wheels on the rail, and this, excepting as the load in the tender may vary, is always a constant quantity; so that the force to break the axle is the same, whether the train be large or small, or there be no train at all. This force is, after the moment of impact, to be viewed as a dead pressure, wherein velocity is not brought into consideration; and if viewed as a percussive force, as in the moment of impact, then the velocity of the force is that of the train; but the mass of the train forms no part of the force.

By the light then of all the recognised and calculable laws of force and motion, we are unable to discover any cause why the axle should have been broken upon this occasion. By this light we may perceive, although unable to calculate, the influence of a peculiar conjuncture of circumstances, but we cannot find any reason why it should have come into action at this particular time rather than in past times. So the two French Academicians appear to have thought, and true to their breeding in not looking about them in any other direction, they did not attempt to assign a reason for it, or even to moot the point. But there is a circumstance behind, which being on the surface of things and merely of a practical character, was on that very account likely to be overlooked by scientific men—just as the cause of the *wabbling* jumping motion of a locomotive, in the want of a perfect equilibrium in the revolving parts, was undetected by them—a circumstance which being important in itself, and imparting additional force to the other circumstances, will, I think, satisfactorily explain the cause of this accident. It is simply that of the suddenness with which the break was brought into action, by

which the stress on the axle was rendered almost instantaneous.

It most commonly happens in practical matters that we are unable to calculate forces in the way of the mathematicians, but must estimate them as well as we can —for calculate them we cannot—by the effects which experience, or special experiments, teach us to expect under certain circumstances. It is so in this case. In the science of statics, the forces of pressures are regarded in the single aspect of their equilibrium; their effects on the molecular forces, in causing the disruption of materials, is altogether a practical question, left to be investigated in a practical manner by practical men, and just because the subject is one which science is unable to fathom. Science, potentially speaking, is truly applicable to it, but it is beyond our ability to apply it. So also in Dynamics, the forces of bodies in motion, are regarded solely in the aspect of their producing *the same kind of motion* in other bodies; their effects on the adhesive and cohesive forces, in the production of *intestine motion*, and especially the peculiarity of those effects, as resulting from a percussive instead of a pressing force, belong to another eminently practical, and a perpetually occurring subject, with which science cannot cope. It may have been expected *à priori*, that as we have thus one science whose subject matter is force simply considered, and another wherein it is combined with velocity in the simple power of that velocity, that there would have been a third in which it is measured by the square of the velocity. There is accordingly a class of effects corresponding to that measure alone, but we have no science of that kind, not even a name for such an investigation, whether scientific or practical; nay, so little is science conversant with such matters, that we have not even a distinctive term for such a product as the mass multiplied into the square of the velocity; for the word impetus, which would seem to be most appropriate, is generally confounded with momentum. I do not refer to this matter, in the same sense in which it was the subject of the celebrated controversy on the *vis viva* among the mathematicians of the last century, and which, after all—who would believe it?—was found to be little better than a verbal dispute; but I allude to it as a distinct science—*potentially* at least —with a class of effects peculiar to it, and peremptorily requiring this expression of force as its proper and only measure; a class of effects different from either the equilibrium or the motion of masses, with which only mathematicians concern themselves.

There is another very important class of effects, which has not been made the subject even of a practical and experimental inquiry, but with which practical men are fully conversant, and are continually taking into account, in what might be called their rough estimate of things, if that estimate, through a natural and an educated tact for such matters, were not so frequently found to be wondrously exact. In this class of effects, the disintegration of bodies is to be found, as influenced, not exclusively by the conditions of the acting force—not by its magnitude, not by its velocity, nor by its power in combination, proportional to any particular power of the velocity, but by the conditions of the action itself, in regard to the element of time, whether as influenced by the mechanical or the physical circumstances of the body acted on or by the peculiar state of its molecular forces. Thus the *same* force—identical in every particular—shall produce different effects on the same body, according as the time of its action is varied by these circumstances. This is no subject for calculation, and scarcely for reasoning; for that bodies should be taken by surprise, as it were—that they should be more or less powerfully affected, according to the warning they receive, is, indeed, if properly reflected on, a mysterious and a wondrous thing. It is, however, a fact, that the molecular forces are inclined to give way, by the mere suddenness of a shock, however it may be brought about. Of course it will be most usually effected through the velocity of the acting force; still, any circumstance that gives or withholds time for the percussive action to be distributed among the other particles of the mass has a corresponding effect. Of this truth, many familiar instances may be cited, but it would be tedious;* the prin-

* I may mention one instance, which has not, that I am aware, been explained on this principle; and that is, the mode of blasting rocks by placing loose sand on the gunpowder. The result is not what at first sight would be anticipated, because

cipal object is to bring it in explanation of the cause of the accident in question.

The stress on the axle, when the break is applied, is of course very considerable; at the moment of impact it is at once a percussive and a constant force, but afterwards it is merely a continuous pressure. Now it is in the moment and for the reason mentioned, that the greatest danger is to be apprehended; and it is imminent in some unknown ratio of the approach to instantaneousness in the action. In practice, the springs of the tender and the deliberate handling of the break, render the impact gradual, both in force and suddenness, and the strain is little greater than is due to the continuous pressure. Had the tender in this case any springs? The break at any rate appears to have been hastily and powerfully brought into action, and hence, as I conceive, the accident arose.

The distinguishing and characteristic error of theorists and mere scientific men is, to view every subject solely in the light of the rule and method knowledge acquired at school or college. It is the case here; the two French *savans* commissioned by their brother *savans* can find nothing in the circumstances of this sad event to occasion the breaking of the axle. It was an *accident*, an ultimate fact, which is no more to be accounted for than it is in future to be prevented, and is only to be mitigated in its dreadful consequences by palliative measures. Mathematically speaking, they are right; by all the rules of science the axle ought not to have broken; but as it did break, and as the supremacy and all-sufficiency of the mathematics is not to be impugned, and as it is impossible to slander the maker and the material, the only way to save the credit and the assumed competency of scientific acumen for a satisfactory investigation of such matters, is in pointing out merely the conditional and the aggravating circumstances of the accident, to make it appear that they had detected therein its real and efficient causes. Although every one of the faults adverted to by these gentlemen as having been committed on this occasion had been avoided, still the accident would have been likely to occur, and with consequences less dreadful only in extent. Thus if I am right in my conjecture as to the cause of the breaking of the axle, and as to the particular axle broken being that to which the break is applied, the substitution of six-wheel locomotives for four-wheel ones, as recommended by them, would not prevent a similar disaster, for it was occasioned by the breaking down of the four-wheel tender. The recommendation, to be good for any thing, ought to have gone to the extent of advising the adaptation of six wheels to every description of carriage. I apprehend, however, there is no necessity for this, although, in regard to locomotives, it may in other respects be preferable; for surely there is no difficulty in devising the mechanical expedient, which I believe has in some instances been adopted, of supporting and sliding the carriage on a sledge, in case either a wheel or an axle should fail.

The preceding observations are based upon the assumption, raised solely from the circumstances of the case as reported, that the axle which failed must have been that to which the break is applied; but since they were written, I have seen a statement in the *Times*, which asserts that such was the fact.

The instruction that we ought more particularly to gather from this accident, is the great importance of selecting well qualified men to act as engine drivers, the qualifications, however, being those of the mind rather than of the hand, and of the necessity of providing the means for carefully instructing them in the duties they have to perform; and then of insisting that none other than the regularly appointed driver, be allowed on any pretence to interfere in the management of the engine. The office ought to be held as sacred and as important as that of the pilot. The men should receive a respectable pay, and they should be allowed to take apprentices. In regard to the instruction that ought to be given them, we are liable to go astray; we are liable to be led away by that delusive and really illiterate notion, which none but the half-informed should be found to entertain, that scientific knowledge is more to be depended on in the conduct of the active affairs of life, than practical knowledge and experience. I would rather trust my life to the watchfulness, the presence of mind, the quick-

different times are required for the production of effects of different kinds. The rock is rent before motion can be propagated among loose particles, to the effect of blowing the sand out of the hole.

of thought, the decision, and the ptitude of action, of an experienced careful engine driver, than I would the learning and science of a Dr. ner and a Professor Barlow com- l. The want of such and similar ties of mind, would be poorly com- ited by a smattering acquaintance the science of steam; and the no- of imparting to engine drivers any ledge of this sort, as a *necessary* fication for a right discharge of duties, is a strange delusion. With d to the properties of steam as a e *agent*, they have nothing to learn scientific men, they have already necessity acquired the substantial ledge of the subject, as embodied *facts*, and for them, that is all that nted. Of what value for instance d it be to them, to know the law h connects the temperatures with elasticities of steam, and if, *mal- pos*, they sought information on that , the most scientific instructor would bliged to confess, that he was as ant of the matter as themselves. ainly, ordinary men should not be ted for this office, but the requisite ties of mind, no scientific instruction impart; and although some little ledge, by courtesy called scientific, in itself do no harm, if no good, yet ould be a serious evil, if small and eited pretensions of this sort were to ate on the minds of Directors in their ir, to the exclusion of less literate really better qualified men. There danger lest too great importance ld be attached to this petty but pre- ing species of instruction, to the ex- on or to the depreciation of that r instruction, really and literally of consequence, which they ought to ve, as to management of the engine r various contingencies, and in re- t to minute details of a practical and of a scientific character. Surely a rate school for such instruction could nstituted in every large railway estab- nent, the suitable scholars of which d be the apprentices; and the mas- f it ought himself to have been an ligent and long-practised engine- er, or at least a man who has had le experience as to the proper man- of conducting an engine. A scien- man in such a situation would only a laughing-stock.

It may be said, that if I am right in my opinion, as to the accident in France having been occasioned by the misman-agement of the engine, in the way I have particularised, it affords a good reason why the driver should have information of a scientific character imparted to him. Not in the least; there is no science in any knowledge bearing upon the point; and if there were, the knowledge with-out the science is quite sufficient; and that knowledge is of the practical kind, taught, I may say, to all, by the most ordinary experience. Who does not know, especially among working men, the effect of sudden resistance to per-cussive force, and the way to mitigate or increase its action? There is scope, it is true, in the range of practical affairs for acumen to be evinced, and it is so, commonly, in the application of familiar truths, to cases, in which, by their in-frequency, it is not familiarly displayed; but of this the most highly accomplished scientific man, may, as we have seen, be as deficient as the most ignorant. A talent of this kind, often enough to be found among practical men, may be re-quired in the instructor; but neither by him nor his scholars need the science of the thing be understood, nor indeed can it possibly be acquired in most practical cases, including the one in question, and that simply because it is not in existence. The great and prevailing error is sup-posing *science* alone, to be knowledge, and the absence of it, to be ignorance. Artizans, and indeed operatives gener-ally, may not have learned the language of science; they may not be able to em-ploy its formulæ of calculation, and yet on precisely the same subjects which it is able to grasp, they may possess all the substance of useful practical knowledge notwithstanding, and are much better informed in respect to it, and much more shrewd in the application of it, than scientific men are aware of, or give them credit for.* It would be woe for us, and themselves too, if it were not so, intrusted as they necessarily are with the conduct of the most critical matters in the business of life. There is a great deal of science, for instance, connected with the action of the wind upon the

* It used to be very amusing to hear Dr. Lardner *lowering himself* down to the comprehension of his audience, even when his auditors were Civil Engineers!

sails of a ship, more indeed than has or can be expounded; and yet there is a substantial practical knowledge of the same thing, without the least smattering of science in it, by which our sailors are, and ever have been, as well qualified to manage their sails as the most accomplished mathematician, and peradventure *a little better*.

I am Sir, yours, &c.,

BEN. CHEVERTON.

RAILROADS IN FRANCE — GOVERNMENT PREVENTIVE MEASURES SUGGESTED BY THE LATE ACCIDENT.

The French Minister of Public Works has provisionally issued the following orders. They are so good—most of them—as almost to make us regret that we have not a Minister invested with equal authority in this country.

1. The employment of locomotives on *four wheels* is forbidden with passenger trains.

2. Neither tender nor any other carriage on four wheels to be placed at the head of the trains before the locomotives.

3. The locomotives to be placed at the head of the train, and never behind.

This regulation never to be violated, except in case of changing the direction of the trains at the stations, or in case of a train being stopped by accident, and that it should be necessary to send assistance from behind the train; but in such case the speed of the train not to exceed 22 kilometres the hour.

It is moreover absolutely forbidden to enclose a train between two locomotives, one before and the other behind.

4. Until a better mode shall have been discovered to diminish the effect of shocks and collisions, there shall be placed one wagon without passengers at the head of each train composed of five carriages at most, and of two wagons, when the number of carriages in the train shall exceed five.

5. The passengers' carriages never to be locked.

6. Every railroad company to keep books, in which shall be entered the state and length of service of every axle-tree, whether straight or curved.

7. The Prefect will publish an ordinance stating the interval at which two trains are to succeed each other.

8. The speed of the trains in their descent from Versailles to Paris, on either line, not to exceed 39 kilometres per hour.

Independently of the above measures, the Minister of Public Works has requested the Committee on Steam-engines to examine—

1. Whether, in the descent from Versailles to Paris, and in fact in all rapid descents, it would be advisable to prohibit the use of more than one locomotive; and, if not, under what regulations they should be tolerated.

2. To discover the best mode of preventing inflammable matter from being communicated by the locomotives.

The Minister is moreover about to appoint a special commission to make experiments—

1. Upon the degree of perfection to which the axletrees of locomotives may be brought, and the length of time they ought to remain in use.

2. Upon the different means to be employed in order to diminish the effects and danger of collisions on railroads.

RAILROADS IN ENGLAND—THE LOCKING-IN SYSTEM.

In the House of Lords (May 23) Lord Campbell having made an inquiry of ministers whether any steps had been taken to abolish in England the practice of locking in the passengers by railways, which had recently been productive of such disastrous results in France, the Earl of Ripon (President of the Board of Trade) made the following reply:—

"It was perfectly true, as the noble and learned lord had said, that the recent dreadful accident on a railway near Paris had excited great alarm in the public mind in this country, and more particularly as it was said that the accident would not have been attended with such a frightful loss of life had not the doors of the carriages been locked on both sides. Finding this so, the office with which he was connected felt it necessary to see what ought to be done, but first it became necessary to ascertain what was the practice as to locking the doors at both sides. On inquiry it was found that the Great Western Railway Company was the only one in which both sides of the carriages were locked. All the others were locked only on one side. Feeling that this was a practice attended with danger, and being aware of the fatal consequences which it had recently occasioned, he consulted the inspector of railways as to what ought to be done in the matter, and whether any neces-

sity existed for this locking of both sides. The inspector gave it as his opinion that the practice was dangerous; that he saw no benefit which could be gained by it; and that, therefore, it ought not to be continued. In consequence of this opinion of the inspector he (the Earl of Ripon) caused circulars to be addressed to the several railway companies, inviting their attention to the practice as one which experience had shown to be attended with danger. This was all which the act would allow him to do, for the house would see the difficulties of giving to any one branch of the Government the power of making regulations for those companies. However, the attention of those bodies having been thus called to the subject would have the desired effect, and he was sure that the directors of the Great Western Railway would give the matter their best consideration."

CORROSION OF IRON IN STEAM-BOILERS AND STOVE-PIPES IN WHICH ANTHRACITE IS USED.

Report of the Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination the Corrosion of Iron in Steam-boilers and Stove-pipes, where Anthracite is employed as fuel.

The Committee have gathered such information as lay in their power from those who have witnessed the corrosive action, and combined it with their own observations.

It appears that stove-pipes are frequently corroded in the course of a year or two, where they are not taken down or cleansed subsequent to their employment through the winter season. An instance is known in which forty feet of pipe were corroded and rendered a perfect colander in the course of two years. Nor does it appear always as a necessary condition that the place should be damp, although this is the case in a majority of instances, for in the corrosion just noticed, the proprietor stated that the stove was very dry. The corrosion rarely happens in an upright pipe, but usually in one lying horizontally, for where such corrosion had already commenced it was said, in one instance, to have been obviated by giving the pipe a slight inclination. Where it takes place in an upright pipe, it may arise from the flowing down of corroding matter from a horizontal layer of the same.

The same kind of corrosion is observable in steam-boilers in which anthracite is employed as fuel, and not in those in which bituminous coal is used. That it does not arise from the intensity of the heat is shown from the fact, that it is greatest in the boiler-flues which lie horizontally at a distance from the fire. A corrosion is sometimes observed near the top of the smoke-pipe in steam-boats, but this may be attributed to the alternate action of heat, cold, air, and moisture.

It would appear, then, that the corrosion is caused either by the vapours arising from the combustion of anthracite, or from matter carried up mechanically by the draft, or from both combined. That it does not proceed from uncondensable gaseous matter is proved by the occurrence of the corrosion only when a stove-pipe is no longer exposed to these vapours during the summer season, or where a boiler is cooled from intermitted fires. It does not arise from matter carried up mechanically, for this could only be ashes, and we know that the ashes of anthracite is of a dry nature, and without moisture, chemical action, or the corrosion, could not occur. It must, therefore, be produced from condensable vapours.

On examining the interior of a stove-pipe lying horizontally, whether corroded or not, we find a loose ashy deposit of a greyish brown colour, and where corrosion has taken place, the greater part is condensed into a solid mass, showing that it had absorbed water. Upon fracturing the solid material, small white crystals appear under the microscope, which are generally too imperfect to admit of recognizing their form. By subliming the mass, a little empyreumatic oil and water are formed, but the greater part sublimed is an ammoniacal salt. Upon testing a solution of the ashes, it shows a large content of muriate and sulphate of ammonia, the formerly evidently in much greater quantity than the sulphate. After complete sublimation at a red heat, the ashy matter remaining appears to be nearly pure charcoal or lamp black, with a mere trace of coal ashes. From the qualitative tests made, it would appear that the ammoniacal salts constitute at least three-fourths of the whole mass. A mere trace of iron was detected.

From this content of saline matter, as well as from its nature, we are at no loss to account for the corrosion of iron where the air and moisture add their conjoint action; but it may be doubted whether the ashy matter has the power of absorbing moisture from an atmosphere of ordinary dryness, for in dry situations, it appears that there is usually no corrosion, and in the case noticed at the commencement of the report, it may be doubted whether the stove was dry.

How to obviate the corrosive action is a

more difficult point to determine, unless the very simple process be resorted to, of cleaning out stove-pipes every spring, and boiler-flues every few weeks. If the stove-pipes are required to remain standing with the sediment in them, then a previous internal coating of white lead, litharge, or red lead might probably answer the best purpose, since it would result in the production of chloride and sulphate of lead, while the ammonia would be driven off. The thin coating of these salts of lead might then prevent the contact and further action of the ashy deposit. Experiments made at the U. S. Mint during the winter of 40—41, seem to show that a coating of lime on the interior of a pipe prevents corrosion, and it is said that a few stove manufacturers in this city are acquainted with the fact. The committee, however, in the face of these facts, are rather inclined to believe that the oxide of lead will prove more efficient, since the sulphate of lead is a wholly inert salt, and the chloride nearly insoluble, while the sulphate of lime is somewhat soluble, and the chloride of calcium very soluble, and therefore likely to produce corrosive action eventually. Still the operation of whitewashing is the simplest mode of obviating corrosion, and may be repeated at invervals.

The content of chlorine to such an extent as is developed by the above chemical examination, is interesting in a geological point of view, since it has not hitherto been found in chemical examinations of anthracite. Prof. H. D. Rogers, in 1836, pointed out the fact, that where heaps of refuse matter were burned near the coal mines, ammoniacal salts, and among them muriate of ammonia, are sublimed, and may be found among the ashes. Now we know that saline waters are obtained from the coal measures in the western district of Pennsylvania, and moreover, it is the prevailing opinion among geologists, that the coal series are marine deposits; we can therefore explain the origin of the muriate of ammonia in the ashy deposit arising from the combustion of anthracite, by attributing the chlorine to the presence of a trace of chloride of sodium (common salt) in the coal or its accompanying slate, or possibly in both. It is unnecessary to allude to the formation of ammonia, since it is a universal product to a greater or less extent of the dry distillation or combustion of every kind of coal.

This ammoniacal deposit is interesting in an economical point of view, since it accumulates in considerable quantity in a single season, and may be collected with facility. In one instance, at least, ten pounds were removed from about eight to ten feet of pipe, which was the produce of three or four years, and hence we may estimate the large amount that might be obtained from many hundred pipes in Philadelphia every season. It may be employed either for the manufacture of sal ammoniac, by a very simple process of sublimation with a small quantity of a salt of lime, or it may be directly applied in powder or in solution to garden soils. The influence of ammoniacal salts in promoting luxuriant vegetation has long been known; but the admirable work of Prof. Liebig on Agricultural Chemistry has more completely developed their influence and importance. The material before us will unquestionably prove of great value to the gardener and florist, if properly applied to the soil; but it must not be forgotten that it is very rich in ammonia, and should therefore be employed sparingly.

By order of the Committee,

WILLIAM HAMILTON, Actuary.

Feb. 10, 1842.

Frankfort Journal.

LIVING UNDER WATER WITHOUT COMMUNICATION WITH THE ATMOSPHERE.—DR. PAYERNE'S EXPERIMENTS.

One of the most remarkable experiments of modern times, was performed last week by a Dr. Payerne, at that excellent experimental school, the Polytechnic Institution, Regent-street.* Dr. P. descended in the great diving bell of that establishment, in his ordinary dress, and remained there for the space of three hours without any communication whatever with the upper air, and apparently without having been in the slightest degree affected or inconvenienced by his long submersion. He states that he could just as easily have remained down twelve or twenty-four hours; indeed he assigns no

* The liberality and readiness with which the managers of this thriving institution allow all experiments, of a nature likely to interest or benefit the public, to be made on their premises, and furnish every facility in their power for the purpose, is beyond all praise. Whatever the institution possesses in the way of instruments and apparatus is placed at the command of the experimenter—extra labour and expense are all that he has to pay for. It is only necessary that the party should be respectably recommended. The institution is now possessed of the very largest electrical apparatus in the world; the glass plate is 7 feet in diameter, and worked by a steam-engine! And even that, persons engaged in electrical investigations may have the use of. The manager, Mr. Sievier, (the eminent sculptor,) with his colleague, Mr. Longbottom, the secretary, are indefatigable in their exertions to render the Polytechnic what it will, without doubt, soon become, the first experimental philosophy school in the metropolis.

to his powers of sub-aqueous vitality. :al Pasley, and several other eminent ific individuals kept watch at the bell g the whole of the three hours, and perfectly satisfied that no supply of air was conveyed to Dr. Payerne from e.

w that this surprising feat, so long re- d as of the class of physical impossi- s has been at last accomplished, every as usual) is discovering how easy it is. only to take down with you something will absorb the carbonic acid gas as fast n generate it, and something else (with ifer match or two to heat it) from . you may set free oxygen enough to you alive. Doubtless these are the conditions of the experiment—and there :veral well-known substances which do ss these two requisites. Pure potassa, ample, will absorb nearly half its weight :bonic acid gas; and chlorate of potass out when heated 3915 parts per 100 of n. The judgment and skill, however, have formed out of such abstract is and (*quoad hoc*) unapplied facts as (supposing the conjectures that point m to be correct) a practical means of under water—which have realized so balance or adjustment of essential yet :ting elements—cannot be of an every- ast, and unquestionably entitle Dr. ne to take a high place among the in- 's and discoverers of the age.

: practical applications which this new mits of, are numerous and important. g-bells and helmets will now be freed ill those cumbrous, yet delicate append- which make working with them so dif- and in no case free from considerable r. Works under water will be pro- d with almost as much ease as works . Valuable wrecks will no longer lie ;es on our shores, hidden and unex- l; but within a month or two of their ingulfed, restore their treasures to aring and industry of man. For pur- of war, too—power to wage which, with tage, is always, in just hands, the best ty for peace—this invention will be invaluable. Dr. Payerne is said to be now engaged in constructing a sub-aqueous boat in which he will undertake to enter any enemy's harbour unseen, and in a single day apply the means of destruction to every ship it contains.

RECENT AMERICAN PATENTS.

[Selected and abridged from the *Franklin Journal*.]

IMPROVED STEAM ENGINE. *John Ericcson*, of Sweden, now residing in New York. The claim appended to the specification of this patent will give a sufficiently clear idea of the invention: it is as follows, viz. Having thus fully described the nature of my invention, and shown the manner in which I carry the same into operation, I do hereby declare that I do not claim to be the inventor of steam engines having radial pistons, which vibrate or perform partial rotary movements within semicylinders, or other segments of cylinders, such engines having been before known and used; but what I do claim as my invention, is the propelling of steam carriages by the combining of two semi-cylinders, each furnished with radial pistons, which pistons vibrate within them, said semi-cylinders being placed on a level with each other; and the shafts, or axles, of their radial pistons extending through the cylindrical covers in opposite directions beyond the sides of a locomotive carriage, and having crank levers attached to their outer ends, which crank levers are connected by suitable rods, to crank pins on the driving wheels. I likewise claim the employment of the same apparatus for the driving of the propelling, or paddle, wheels of such vessels as are propelled by the power of steam.

IMPROVEMENT IN THE METHOD OF MANUFACTURING BALLS OR SHOT; *Levi Magers*. Baltimore. The moulds which are to be used are made upon the sides of any number of square bars of iron, are arranged in a reciprocating carriage, so that they can be separated at the end of each operation to discharge the balls that have been cast, and reclosed. For this purpose the bars slide on the carriage at right angles to its length, and all the bars are connected with one lever, each by a separate link, the connecting link of the outside bar being furthest from the fulcrum of the lever, and the others nearer and nearer the fulcrum, so that by one movement of the lever the bars will all be separated. A furnace and kettle, containing the lead, are arranged over the car-

riage of moulds, and are provided with the necessary appendages to allow the molten lead to run into the moulds as they pass under the kettle, and to stop its flow when the carriage of moulds arrives at the end of its course.

The claim is to the combination of the furnace and kettle with the moulds, and also to the combination and arrangement of the moulds with the carriage.

Improvement in the Spark Extinguisher; *David Ritter*. New Haven. At the top of the ordinary chimney of a locomotive steam-engine, there is placed a cap pierced with three holes, one at top, one in front, and the third at the back; the two former have hinged covers, which can be opened for firing up, and the other provided with a conducting tube which runs over the engine and turns down at right angles, and is to discharge the sparks, &c. into a reservoir containing water, and covered with wire gauze for the escape of the draught.

Claim.—"I do not claim as my invention, the conductor for carrying off the sparks from the chimney of the locomotive, nor the openings for the draught on the top or in front of it, which openings may be used or not, as occasion may require. But I do claim as my invention the combination of the cistern or reservoir of water with the conductor for carrying the sparks and dust from the chimney, and depositing them perpendicularly downward in the reservoir, and thereby extinguishing the spars and absorbing the dust, permitting the smoke only to escape from the reservoir."

Improvements in the manner of Taking Measure of the Human Body for the purpose of Drafting and Cutting Coats; *Thomas E. Tilden*, Baltimore. The patentee says—"My first improvement consists of a simple instrument which I denominate Tilden's Daguerreotype, or transfer ruler; and my second improvement consists in the manner of applying the common tape measure, divided into inches and parts of inches, so as to draft and cut from a point, or points, ascertained by the transfer ruler, which system of measuring I denominate Tilden's Balancing system."

The transfer ruler is simply a straight strip of wood, having a spirit level fixed on the middle, or on any other convenient part, of one of its flat sides, and two sliding arms which project out from said ruler at right angles to its length, and by the use of this, and the ordinary measuring tape, all the required measures are obtained.

Claim.—"What I claim as new and desire to obtain by letters patent, is first, the manner of constructing and using the instrument which I have called the transfer ruler, for obtaining a point on the back of the person to be fitted, which shall be in the same horizontal line with the under part of the arms, and for obtaining two such points where the arms, or shoulders, are of unequal height, from which point, or points, the principal measures, constituting my balancing system, are to be taken. Secondly, the manner of taking what I have called my second shoulder measure by the aid of said point or points; also the manner of taking my third shoulder measure as related to and employing the said point or points; and lastly, I claim the manner in which I take what I have herein called my balance measure, and of using the same in drafting for the purpose of cutting, so as to test and balance the respective measures obtained by the mark, or marks, on the middle of the back."

Improvements in the Spark Arrester; *William P. M'Connell*, Washington. The smoke and sparks are to be drawn into a rotary fan blower, placed in the smoke-box, by which they are forced up a pipe, and then thrown into a reservoir of water placed above the smoke-box; the smoke and gases pass up through the openings of a perforated plate and out of the chimney, the draught of which is to be increased by the steam from the exhaust pipes. The water reservoir is provided with two pipes and cocks for discharging the water and cinders when desired, and it is also surrounded with a case of larger diameter, leaving a space between the two, and from this space tubes descend, so that the water and extinguished sparks which may be carried over the edge of the water reservoir, may descend and be discharged.

Improved Vessel, or Locomotive Steamer; *George Burnham*, Philadelphia. The patentee says:—"My vessel, or locomotive steamer, is to be rendered buoyant, and to be propelled by means of hollow, air-tight floats, in the form of drums, or spheroids, or spheres, which are to be of such capacity as to sustain the vessel and its load, without the dipping of any part of the hull, or body, of the vessel into the water, and without the submersion of any larger portion of such hollow floats than shall be compatible with their being advantageously used to carry buckets or paddles, for the purpose of propelling said vessel. These floats are to operate in water in a manner somewhat resembling that of the propelling wheels of locomotives on land; but they must, of course, be furnished with buckets.

or paddles, to act upon the water in the manner of the ordinary paddle wheels of steamboats.

"I do not claim to be the first to have used buoyant cylinders, or floats, having paddles or buckets upon their peripheries; but what I do claim is the using of revolving floats for obtaining buoyancy, and as propellers, in the manner herein set forth: that is to say, said floats being in diameter equal to that of the paddle wheels ordinarily employed, and like them, rising above the deck of the vessel, and being furnished with buckets, or paddles, the outer edges of which are to be on a line, or nearly so, with that of the peripheries of the floats."

PROPELLING BOATS BY JETS OF WATER; *Hugh Ronalds.* The propelling of boats by means of jets, or currents of water, has repeatedly been patented in Europe and in America, under various modifications; in the present plan there are two cylinders lying horizontally in the vessel, and open at the stern. These cylinders are each provided with a piston impelled by a steam engine. The improvement claimed is to the making of the inner ends of the cylinders open to the atmosphere for the free egress and ingress of the air during the back and forward movement of the pistons, the water as it flows into said cylinders doing so by hydrostatic pressure only.

MACHINE FOR OVERHAULING CLOTH WHILE FULLING; *John Tillou*, New Haven. The patentee says—"The design and object of my machine is to remove mill-wrinkles, and to make a smooth surface on cloth by means of a force so applied as to stretch the cloth widthwise, while the rolling cylinders passing the cloth, draw and stretch it lengthwise." "The principle is applicable to machinery for overhauling cloth while fulling, and for extending cloth while napping or shearing, or in lieu of revolving temples for weaving."

Two pairs of chains working over rollers and armed with rubbers, pass over and under the surface of the cloth at right angles to its length, the two nearly meeting in the middle of the cloth, and running in opposite directions, rub out the wrinkles—this is called the "transverse rubber." The cloth, after leaving these chains, passes between two sets of oblique rollers, the axis of one set forming an obtuse angle with the other, called "oblique stretchers," which stretch the cloth width-wise.

APPARATUS FOR RAISING WATER, CALLED THE ÆLOPILE HYDRAULIC APPARATUS; *Pierre Ravard*, Paris, France, assigned to Eugene Ablon, of New York. "It is a well known fact," says the patentee, "that when steam is allowed to escape rapidly through a small orifice into the atmosphere, it carries with it a considerable portion of the surrounding air, and that the instrument denominated the ælopile has been, from this circumstance, proposed to be applied to the blowing of air into forges and furnaces. The same principle is also applied in the locomotive steam engine to create a partial vacuum in the furnace, by projecting a jet of waste steam up the chimney, which carries with it a large portion of air, thereby effecting the object desired. In my apparatus for raising water I apply the same principle to the producing of a partial vacuum in suitable receivers, into which water is then to be forced from the well, or other reservoir, by the pressure of the atmosphere."

The claim is to the combination and arrangement of the various parts of the apparatus with the view of applying the principle above indicated, to the raising of water.

MACHINE FOR SPINNING SILK; *George Heritage*, Chestertown. This machine is for spinning silk directly from the cocoons, and giving the necessary twist to it at the same time. The cocoons are placed in revolving pans, (for a description of which the reader is referred to the notice of the patent next following) which give the first twist to the strands; the threads are then guided to two square shafts, around which they pass, the axles of which are parallel; these are divided into sections of different diameters, for the purpose of drawing the threads from the cocoons with different degrees of velocity, to give different degrees of fineness and twist; the threads pass thence to the flyers and spindles, which are of the usual construction.

MACHINERY FOR REELING SILK FROM THE COCOONS; *George Heritage.* It is observed in the specification, that "in the ordinary mode of reeling silk from the cocoons, and forming from it what is known under the name of raw silk: the fibres from the respective cocoons form a flat, angular, or irregular thread, as they do not receive any twist on their way to the reel from the basin or vessel containing them. By my improved machinery, I cause the respective fibres which are to form one thread, to twist together, as the cocoons are unwound, and in consequence of such twisting to form a round thread when wound upon the reel, which round thread is much better adapted to various uses in the silk manufacture, than the raw silk as heretofore formed." To effect this, the basin in which the cocoons are placed is attached to a spindle with

which it revolves, and the basin is divided into compartments, so that the water contained in it, with the cocoons, revolve with it, and give the desired twist.

Improvement in Wind-mills; *Isaac Garver and Samuel Fahrney*, Washington. This patent is for a mode of setting and shifting the sails of wind-mills. The backs of the sails are jointed to the arms, and a rod, attached to the back of each sail, is connected with a thimble on the shaft, by sliding which, the angle of the sail is changed. The sails are kept at their greatest angle by a spring, the end of which is forked and fits into a groove made for that purpose in the thimble. A cord attached to the thimble passes over pulleys and down to within reach of the operator, by means of which the tension of the spring can be overcome, and the sails shifted.

Apparatus for Steering Boats; *Russell Evartz*, Madison. The steering chain in this apparatus is made fast to a segment of a wheel at the rudder head, and passing thence, its ends are wound around, and made fast to two drums on a horizontal shaft, under the tiller house—the distance between the two drums must be equal to the diameter of the wheel at the rudder head; the chain, therefore, always acts upon the wheel in the line of its tangent, and the leverage on the rudder will be unvarying. The shaft of the tiller wheel, which has its bearings in a sliding frame, is provided with wheels of different diameters, either of which may be put in gear with a cog-wheel on the shaft of the drums to which the steering chain is attached. Two chains are made fast to the rudder, and pass along under the gunwhales to the bow, where they are attached to the windlass, by which arrangement the vessel may be steered in case of a fire, which would prevent the use of the tiller or rudder head.

Improvement in the Argand Lamp; *Benjamin Hemmenway*, Roxbury. The object of this improvement is to avoid the necessity of removing the oil chamber, in the fountain lamp, to replenish it with oil. The fountain or reservoir is supplied with oil through a short pipe at top, which is hermetically closed by a leather valve and screw cap; and between the bottom of this reservoir and the pipe that conducts the oil to the burner, is an air chamber, which is supplied with air by a tube passing up through the oil reservoir. From the bottom of the oil reservoir, a tube, provided with a stop cock, descends to within a short distance of the bottom of the air chamber. When the oil chamber is to be replenished, the stop cock, in the tube at the bottom, must be closed, and the valve at the top may then be opened to receive the oil; and when the valve at the top is closed, then the stop cock may be opened. When this has been done, it is evident that the air from the air chamber will rise in the tube, at the bottom of the reservoir, and allow the oil to descend in the air chamber until it reaches the lower end of the said tube, and the oil reservoir being then hermetically closed by the valve at the top, the atmospheric pressure will prevent the further descent of the oil. By this arrangement the inconvenience arising from the overflowing of the common fountain lamp is effectually guarded against; for by making the top of the burner a little higher than the lower end of the tube in the bottom of the oil reservoir, the oil can never rise above the given height.

Method of forming Ice; *Thomas B. Smith*, St. Louis. The patentee says:—"My improved process for the rapid production of ice by the freezing of water, is dependent upon the well known fact, that a thin stratum of water when exposed to an atmosphere, the temperature of which is at, or below, thirty-two degrees of Fahrenheit's scale, very rapidly becomes frozen. It is also a fact that after a thin sheet of ice has been formed upon the surface of water, the process of freezing proceeds but slowly, in consequence of the bad conducting property of ice for the matter of heat. Taking advantage of these laws, I proceed in the formation, or the making of ice, in the following way: I prepare a vat, or other suitable vessel, of wood, or other material, of any size that I may deem convenient, and this I place on a level, in such situation as shall best expose it to the freezing influence of the atmosphere. From any suitable reservoir I cause a portion of water to run into this vat, or other vessel, so as to cover the bottom thereof to the depth of an eighth, or fourth, of an inch, more or less, according to circumstances, and this water I allow to become completely frozen: when this has taken place, I in like manner supply another portion of water to be converted into ice. Proceeding in this way, I quickly obtain a thick stratum of ice, of perfect purity, if the water be pure, and of great solidity."

The vat, or reservoir, is described as being made with movable partitions, to form blocks of any desired size.

Improvements in the Carding Machine; *Ebenezer and Alanson Crane*. The top cards, instead of being permanently attached to the frame, are affixed to a traveling endless belt, passing around a roller at each end, and one at top in the middle: they are prevented from approaching too near to the main card by a segment plate,

which the ends of the pieces, forming :hain, travel. As the top cards ap- :h the top roller, they are stripped by pping card attached to the ends of two eeps," or arms, that receive a recipro- g motion from a crank. After strip- the top cards, it passes over a small anent card which cleans it.

ie rollers and segment are provided with iting screws.

ODE OF WHITENING OR PREPARING T IS TERMED "FAIR LEATHER." 's *C. Booth*, of Philadelphia, Pennsyl- . In order to obtain or put the leather in tate designated, so that it may have the liar light-coloured and fair appearance a is the object of the invention, the pa- e employs the leather in that stage of manufacture when it is in its moist , after it is "finished;" or if it is used ı the leather is dry, then in the latter it must be moistened through with water. While it is thus wet, I spread says) with a sponge, brush, or other ble article, the following liquid compo- ı over the fair surface of the leather, g it sufficient dampness to let the pores :b the liquid. The liquid to be ap- , is a solution of the protomuriate of n muriatic acid, ether, alcohol, and r, and is composed as follows:—Any tity of the protomuriate of tin is dis- d in about one half of the weight of mu- : acid, and to this solution ether is l in the proportion, by weight, of three ; the weight of the protomuriate of tin, then a quantity of alcohol by weight, l to four times the weight of the proto- ate of tin. To this may be superadded fresh water in the proportion of three ı by weight, as compared with the pro- iriate of tin. If the leather to be em- ed under this process is not clear, or is dark or spotted, then a greater propor- of muriatic acid is to be used, say an l quantity, by weight, or twice as ı, by weight, as compared with the omuriate of tin. Immediately after the cation of the above described liquid position to the leather, I spread over it ays) in a similar manner, spirits of tur- ine with or without a small quantity of w dissolved in it, sufficient to make it le, and the leather is suffered to dry in ordinary manner, and the operation is plete. The spirits of turpentine alone generally be sufficient to give pliability e leather after the first composition is oyed, without adding the tallow; but ı the leather is stiff or hard, or not suf- ntly *soft, the tallow* may then be added. *leather after this process* will have the *ed whiteness and fair* appearance.

PROCESS OF MANUFACTURING SULPHATE OF ALUMINE. *Rudolph and Gustava Boninger*, of Baltimore, Maryland, *Assignees of Max Joseph Funcke, of* Eichelskamp, Prussia. The process here patented consists in manufacturing sulphate of alumine, so as to produce the same free, or nearly free, from iron, and from alkali; whereby it is more perfectly adapted to be used as a mordant, or for other purposes, in the useful arts, than the alum of commerce, or than the sulphate of alumine, as ordinarily prepared.—"I take," says the patentee, "potters' clay, pipe clay, or clay of any other kind, as free from iron as it can possibly be obtained; and this I dry at such degree of heat as is necessary to drive off all its free moisture. The clay so calcined is next to be reduced to powder, and this powder I put into suitable leaden vessels, or vessels of other material not acted upon by sulphuric acid; to these vessels a moderate degree of heat is to be applied, by means of steam or otherwise. Sulphuric acid, of 66° Beaumé, is then to be added to the clay, in such quantity as shall suffice to dissolve nearly the whole of the alumine contained in the clay; which may be ascertained by a previous test on a small quantity. An excess of acid should not be used, as the whole ought to be perfectly neutralized by the alumine.

"After the addition of the acid, the mass in the pans is to be stirred until it is perfectly dry; boiling water is then to be added in sufficient quantity to dissolve the whole of the salt. The liquid thus obtained is to be placed in vats, and to remain at rest until it becomes perfectly clear. It should then be tested by means of lime water, to be certain that it does not contain any free acid; and should any be present, lime water is to be added until the whole excess of acid has combined with the lime, and has been precipitated in the form of sulphate of lime. When perfectly clear, the liquid is to be drawn off into other vats, preparatory to the separating from it the iron, which will always be found contained with it in greater or a less quantity. A measured portion of this liquid, say one pint, is then to be taken, and the iron contained in it is to be precipitated, by means of a solution of prussiate of potash, in such manner as to ascertain the exact quantity of said solution necessary to the precipitation of the contained iron. The quantity of liquid contained in the vat being known, the portion of the solution of the prussiate of potash necessary to the precipitation of the whole of the iron will consequently be known, and this is to be added to it, the mixture stirred,

and the prussiate of iron formed, allowed to go to the bottom. The liquid is then to be drawn off clear from the precipitate, and a pure, or nearly pure, solution of sulphate of alumine will be thus obtained; and it may in this state be applied to various purposes in the arts.

"If desired, the water may be quickly evaporated in leaden or other vessels, until a pellicle appears on its surface; when it may be put into suitable forms, and allowed to cool and crystalize, or consolidate.

"I am aware that clay has been heretofore treated with sulphuric acid, to form a sulphate of alumine; and I am also aware that it is known to every chemist that iron may be precipitated from its solutions in sulphuric or other acid, by means of prussiate of potash. I do not, therefore, make any claim to the discovery of either of these processes when taken alone; but I do claim the combination of means herein pointed out for the manufacturing of sulphate of alumine, by which it is produced with greater facility, and in a state of greater purity, than by any of the processes heretofore adopted in its manufacture; that is to say, I claim, in combination, the preparing of the clay by desiccation, the combining thereof with sulphuric acid, and the subsequent solution and precipitation of the iron, substantially in the manner, and for the purpose, herein fully made known."

Apparatus for Heating Buildings by the Circulation of Hot Water through tubes; *George M. Dexter*, Boston. The furnace and the tubes through which the heated water circulates, are arranged in an airchamber, the air within which, when heated, is to be carried off to other apartments, or otherwise employed, as may be desired. The furnace is vertical and surrounded with water except at the door for the supply of fuel. A system of vertical and horizontal tubes communicate with the water chamber of the furnace at top and bottom, by means of which connexion the water is kept in constant circulation.

Claim.—"What I claim as constituting my invention and improvement, is the heating of air in a chamber constructed for that purpose, within which chamber there is a system of tubes, which tubes are heated by causing water to circulate through them in the manner set forth, said water being at a temperature below that of boiling, and being supplied by a heated vessel arranged and operating substantially in the manner described, and the air so heated being conveyed from the said chamber through large trunks or other openings, into the apartments to be warmed, as made known."

An Improvement in Portable Ovens and Stoves; *Edward Gosselin*, City of New York. This patent is for adapting a portable and shifting oven to a cooking stove, the draught of which passes under the top plate. The top plate of the stove is provided with two apertures, one near the front, and the other near the chimney; there being a damper in front of the rear aperture, which, when opened, admits the draught to pass directly out at the chimney, and when closed directs it around the oven, the flue of which is made to fit the two openings in the top plate of the stove, so that the draught passes up at one end of the oven, over the top, down the back, and out at the chimney.

Claim. "What I claim as new and of my own invention, and desire to secure by letters patent, is not the mere combination of a portable oven with a cooking stove, as this is not new; but the combining the oven with the stove in the manner herein set forth, so that the draught from the stove shall pass up on one end of the oven, over the top, and down on the opposite end into the common flue of the stove; that is to say, I claim the combination of an oven constructed in the manner herein set forth, with any cooking stove adapted to receive it, and so regulated as to admit the draught either to pass over the oven and thence into the common flue, or to pass directly into the flue without circulating over the oven, the whole being constructed substantially in the manner herein set forth."

Waterproof Trunks; *Peter Getz*, Lancaster. Pennsylvania. The proposed improvement is adapted to the common trunk, the space in the top, or lid, being made air tight with tinned copper. A box that fits into the body of the trunk, is also made of tinned copper, covered on the top with wood. Into this top is made a hole with a metal ring fitted to it, to receive a cover that screws into this ring, there being a similar ring attached to a copper plate which constitutes the cover. The key hole is made water tight by a screw cap in the same manner with the cover of the box. The whole being thus made water tight, and the upper part or lid of the trunk being an air chamber, the articles contained in the box will not only be preserved from moisture, but the whole may be used as a life-preserver.

The claim is confined to the "method described of rendering trunks water-proof by constructing them with a screwed plate, or lid, in the manner set forth."

LIST OF DESIGNS REGISTERED BETWEEN APRIL 27TH, AND MAY 26TH, 1842.

Date of Registration. 1842.	Number in the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
April 27	1211	George W. Jacob	Apparatus for heating irons	3
"	1212	Robert Howard and Co.	Double action vernivolver reflecting screen	3
28	1213	Edmund Heeley	Letter-clip	3
29	1214	Coalbrookdale Company	Panel ornament	3
"	1215,6	Stoddart and Boycot	Carpet	1
"	1217,8	Cooper, Boyle, and Co.	Stained paper	1
"	1219	Newcomb, Son, and Jones	Carpet	1
"	1220	J. and W. Wood	Elastic spiral pessary	3
May 2	1221	Henry Longden and Son	Stove	3
"	1222	J. and M. Westwood	Steel pen	3
"	1223	Benjamin Nickells	Button	3
3	1224	Samuel Ackroyd	Stove	3
4	1225	James Carpenter	Mortice lock	3
"	1226	William Chesterman	Gridiron	3
"	1227	Newcomb, Son, and Jones	Carpet	1
5	1228	Henry Bunton	Ditto	1
"	1229	Andrew Shanks	Corner drill	3
6	1230	W. Hancock, jun.	Triangular pointed rubber	1
"	1231	J. H. Hood	Portfolio	1
9	1232	Carron Company	Fender	3
"	1233	Thomas Culpin	Horse-rake	3
10	1234	Rice Harris	Rosette	3
"	1235	J. Rawlins	Carriage-spring	3
12	1236	S. Ackroyd	Stove	3
"	1237	Ditto	Fender	3
"	1238	George Gilbert	Ring-hole brace-button	3
13	1239	G. and H. Talbot	Carpet	1
"	1240	Jenner and Bettridge	Fastening for curtain-bands, or loops	3
"	1241	Joseph Bridgen	Window show cards	1
16	1242	J. M. Gladstone	Hand-drill	3
"	1243	R. Foulis	Music note pen	3
18	1244	William Blenkiron	Wristband fastening	1
"	1245	John Hawkins	Fire-escape	3
"	1246	G. Kershaw	Spring letter clip	3
"	1247	William Baddeley	Garden-engine	3
20	1248	Lea and Co.	Carpet	1
"	1249	Alfred Lapworth	Ditto	1
"	1250	Richard Cross	Saddle	1
"	1251	George Fletcher	Metal gland-bolt for sugar-mills	3
25	1252	Gray Brothers	Lamp collar	3
26	1253	Richard Archibald Brooman	Tea-kettle	3
"	1245	John Neil	Tile	3

[AGENTS FOR EFFECTING REGISTRATIONS, MESSRS. ROBERTSON AND CO., 166, FLEET-STREET.]

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 28TH OF APRIL, AND THE 26TH OF MAY, 1842.

Henry Barclay, of Bedford-row, for a composition or compositions applicable as tools or instruments for cutting, grinding, or polishing glass, porcelain, stones, metals, and other hard substances. April 30; four months to specify.

John Robinson, of Watney-street, Commercial-road East, engineer, for improvements in windlasses and capstans. May 3; six months.

John Railton, of Blackburn, machine-maker, for certain improvements in machinery or apparatus for weaving. May 3; six months.

Godfrey Wetzlar, of Myddleton-square, Clerkenwell, for improvements in rendering fabrics waterproof. (Being a communication.) May 7; six months.

Joseph Warren, of Heybridge, Essex, agricultural implement maker, for certain improvements in ploughs. May 9; six months.

Francis Prime Walker, junior, of Manchester, coal-merchant, for certain improvements in the manufacture of candles, candlesticks, or candle-holders, and in the apparatus connected therewith. May 9; six months.

George Haire, of Manchester, gentleman, for certain improvements in machinery or apparatus for sweeping and cleaning chimneys and flues, May 9; six months.

Thomas Edge, of Great Peter-street, Westminster, gas apparatus-manufacturer, for certain improvements in apparatus for gas-water and other fluids. May 9; six months.

Samuel Hall, of Basford, C. E., for improvements in the combustion of fuel and smoke. May 9; six months.

Jacob Wilson, of Wigmore-street, Cavendish-square, upholsterer, for certain improvements in bedsteads. May 9; six months.

William Sanderson, of Aldermanbury, London, silk-manufacturer, for improvements in weaving fabrics to be used for covering buttons. May 9; six months.

John Melville, of Upper Harley-street, esquire, for certain improvements in propelling vessels. May 11; six months.

John Browne, of Brighton, gentleman, for improvements in the manufacture of mud-boots and overalls. May 12; six months.

Thomas Williams, of Bangor, smith, for an improved churn. May 17; six months.

William Brunton, of Neath, Glamorgan, C. E., for an improved method or means of dressing ores and separating metals or minerals from other substances. (For the colonies only.) May 19; 4 months.

Joseph Gibson, of Birmingham, manufacturer, for certain improvements in axletrees and axletree-boxes. May 23; six months.

John Bennet Lawes, of Rotherhampstead, Hertford, gentleman, for certain improvements in manures. May 23; six months.

John Bishop, of Poland-street, Westminster, jeweller, for a new or improved construction of brake apparatus applicable to railway carriages. May 23; six months.

Thomas Middleton, of Loman-street, Southwark, engineer, for an improved method of preparing vegetable gelatine or size for paper, and also an improved mode of applying the same in the manufacture of paper. (Being a communication.) May 23; six months.

William Tudor Mabley, of Henrietta-street, Covent-garden, mechanical draftsman, for improvements in machinery or apparatus for making nails. (Being a communication.) May 23; six months.

Benjamin Cook, junior, of Birmingham, brass-founder, for improvements in the construction of bedsteads, both in metal and wood. May 23; six months.

Frederick Goos, of Manchester, jacquard machine-maker, for certain improvements in the jacquard machine or apparatus, to be used or employed in looms for weaving. May 23; six months.

Sir James Murray, of Merrion-square, Dublin, Doctor of Medicine, for an improved method of combining various materials in a manner not hitherto in use for the purpose of manure. May 23.

James Pilbrow, of Tottenham, engineer, for certain improvements in steam-engines. May 23; six months.

William Geeves, of Old Cavendish-street, gentleman, for improvements in machinery for cutting cork. May 24; six months.

James Stewart, of Osnaburgh-street, Regent's-park, piano-forte maker, for improvements in hinges for piano-fortes and other purposes. May 24; six months.

Thomas Waterhouse, of Edgely, Chester, manufacturer, for a certain improvement or improvements in machinery for carding cotton, wool, flax, silk, and similar fibrous materials. May 24.

Joseph Duce, of Wolverhampton, lock-manufacturer, for an improved lock and key to be used therewith, and an improved slide bolt for the said lock, applicable also to other purposes. May 24; six months.

James Boydell, junior, of Hope Farm Works, Dudley, for improvements in the manufacture of keel plates for vessels, iron gates, gate-posts, fencings, and gratings. May 24; six months.

James Potter, of Manchester, manufacturer, for certain improvements in machinery for spinning cotton, flax, and other fibrous substances. May 25; six months.

Peter Kagenbusch, of Whitby, York, for an improvement in the dyeing of wool, woollen cloths, cotton, silks, and other fabrics and materials. May 26; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND, FROM APRIL 22ND TO MAY 22ND 1842. FOUR MONTHS TO SPECIFY IN EACH CASE.

John Venables, of Burslem, Stafford, earthenware manufacturer, and John Tunnicliff, of Burslem, aforesaid, bricklayer, for a new and improved method of building and constructing ovens used by potters and china-manufacturers, in the firing of their wares. Sealed April 25.

William Newton, of Chancery-lane, civil-engineer, being a communication from abroad, for an improved machine or apparatus for weighing various kinds of articles or goods. April 27.

Joseph Atkinson, of Braham Hall, near Harrowgate, farmer, for improvements in thrashing and winnowing machines. May 4.

John Carr, of North Shields, Northumberland, earthenware manufacturer, and Aaron Ryles, of the same place, agent, for an improved mode of operating in certain processes for ornamenting glass. May 6.

Henry Barrow Rodway, of Birmingham, wine-merchant, for improvements in the manufacture of horse-shoes. May 12.

Sir James Murray, of Merrion-square, Dublin, knight, and Doctor of Medicine, for an improved method of combining various materials in a manner not hitherto in use, for the purpose of manure. May 12.

John George Bodmer, of Manchester, engineer, for certain improvements in machinery, or apparatus for cleaning, carding, roving, and spinning cotton, and other fibrous substances. May 16.

Peter Kagenbusch, of Wetter on Rhur, Westphalia, Dyer, but now of Whitby, England, for an improvement in the dyeing of wool, woollen-cloths, cotton, silks, and other fabrics and materials. May 17.

LIST OF PATENTS FOR IRELAND GRANTED IN MARCH AND APRIL, 1842.

Charles Wye Williams, for certain improvements in the making and moulding of bricks, artificial fuel, and other substances.

Stopford Thomas Jones, for certain improvements in machinery for propelling vessels by steam or other power.

George Jarmon, Robert Cooke, and Joshua Woodsworth, for certain improvements in machinery for spinning flax, hemp, and tow.

William Irving, for improvements in the manufacture of bricks and tiles.

James Thorburn, for certain improvements in machinery for producing knitted fabrics.

John Hall, for improvements in the construction of boilers for generating steam, and in the application of steam to mechanical power.

Richard Hodgson, for improvements in the forms or shapes of materials and substances used for paving and building, and in the combination for such purposes.

Theophile Anton Wilhelm Count de Hompesch, for improvements in obtaining oils and other products from bituminous matters, and in purifying or rectifying oils obtained from such matters.

George Wildes, for improvements in the manufacture of white lead.

Joseph Henry Tuck, for improvements in apparatus or machinery for making or manufacturing candles.

Alphonse René Le Mire de Normandy, for improvements in the manufacture of soap.

John Juckes, for improvements in furnaces and fire-places.

William Brunton, for an improved method or means of dressing ores, and separating metals or minerals from other substances.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 982.] SATURDAY, JUNE 4, 1842. [Price 3*d*.

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BLAXLAND'S PROPELLER.

Fig. 1.

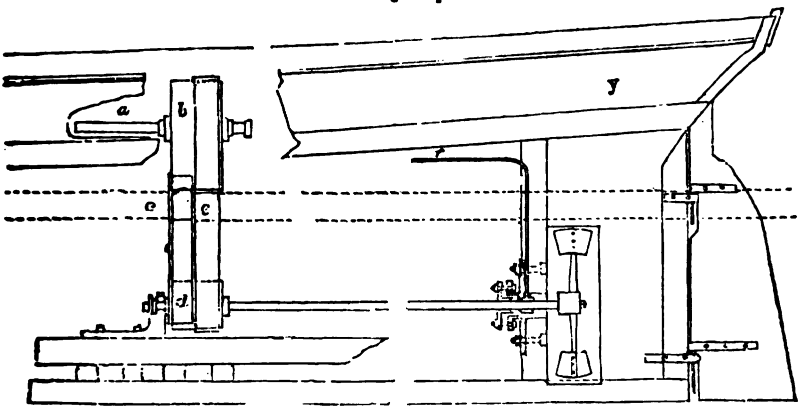


Fig. 2.

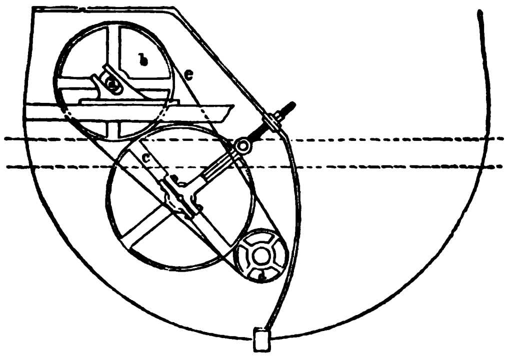


Fig. 3.

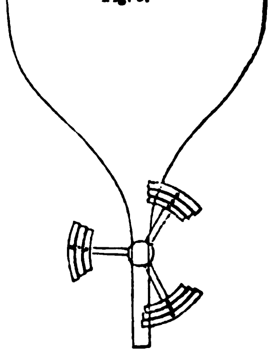


Fig 4.

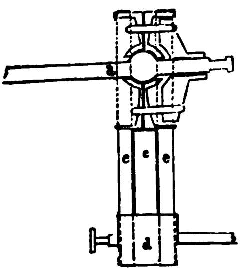


Fig. 5.

ig. 6.

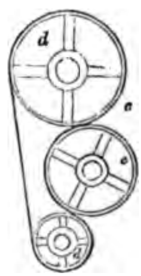


Fig. 7.

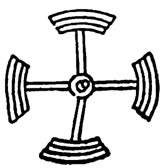


Fig. 8.

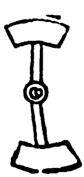
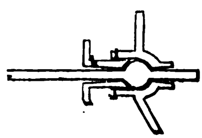


Fig. 9.



In our last volume (p. 209) we gave an account of some very remarkable experiments made with a new stern propeller, invented by Mr. George Blaxland, as applied to the *Jane*, a little vessel of no more than three tons, with a steam-engine of less than one horse power, in which the enterprising inventor had actually made two or three successful *sea* voyages; and we gave also a brief description of the propeller, with a full exposition of the advantages expected from its adoption.

We mentioned at the same time that the well-known commercial steamer the *Swiftsure* (137 tons burden, 40 horse power) had been purchased for the express purpose of having the new propeller applied to her, and its capabilities tested on a large scale.

Before removing the old paddle-wheels from the vessel, several experiments were made with her to ascertain her then rate of going, when it was found not to exceed, under the most favourable circumstances, 7½ miles an hour.

The removal of the paddle-wheels and boxes relieved the vessel of an overhanging weight of 12 tons, 6 cwt., 2 qrs., 16 lbs.; but as we must set off against this the weight of the propeller and its connexions, which is about 4 tons, the total reduction of tonnage is little more than 8 tons.

The reduction in the width of the vessel, from the removal of the paddle-wheels, has been 14 feet, making her present beam 16 ft. 3 in.; her length is 112 feet.

On Saturday, the 21st ult., a trial of the vessel, as thus altered and newly fitted up with Mr. Blaxland's propeller, was made on the river in the presence of the following members of the Board of Admiralty:—the Earl of Haddington; Admiral Sir George Cockburn; Admiral Sir William Hall Gage; Admiral Sir George Francis Seymour; the Hon. Henry Thomas Lowry Corry, (five of the six Lords,) and the Hon. Sidney Herbert, M.P., Chief Secretary, who expressed themselves in the highest degree pleased and satisfied with her performances.

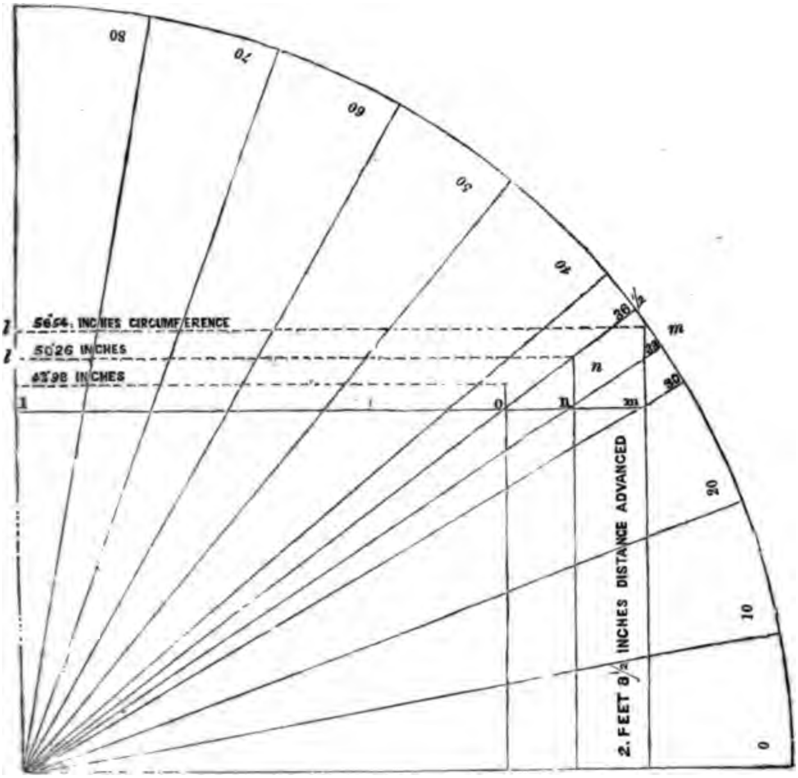
The speed of the vessel is now full nine miles an hour; showing a gain by the substitution of the propellers for the paddle-wheels of a mile and a half per hour. The lines of the *Swiftsure* are very unfavourable to speed; at the bows particularly, which are as bluff as those of a Dutch lugger. A vessel with a fine cutwater, similar to those of the crack Gravesend boats, would no doubt have exhibited a much greater proportional increase of speed. But had the vessel only gone as well as before, there would have been a great advantage achieved in the removal of the propelling machinery from the sides of the vessel to the stern, and its entire submersion there below the water line. Exemption from risk of damage by shot—an end to the retarding influence of backwater—and the removal of every obstacle to the occasional use of sails, are among the more obvious consequences of this improved arrangement.

The gear work, by which the power of the engines (a pair of twenties) is communicated to the propeller shaft, and which has been also patented by Mr. Blaxland, is remarkable for its efficiency, and for the smoothness and stillness of its action. Except at the stern of the vessel, immediately above the propeller, not the least tremor is felt, nor noise heard. The vessel moves so silently through the water, and the propeller is so entirely out of sight, that, were it not for the engine chimney, one would be puzzled to conjecture by what means she is propelled.

We had the pleasure of being personally present at a subsequent experiment made with the *Swiftsure*, and of verifying the preceding statements in every particular. Not a single drawback from the utility of the invention were we able to detect. Often before has the paddle-wheel been threatened to be superseded, but never, to our mind, with so good a prospect of success. Mr. Blaxland's propeller accomplishes all that can ever be expected to be accomplished by the screw, whether employed according to Mr. Smith's plan, or to Captain Ericsson's; while it is wholly free from the mechanical objections inseparable from the use of that agent. Whether any other form of propeller, if applied and worked in the same way as Mr. Blaxland's would not answer equally well, we need not at present stop to enquire; for Mr. Blaxland's propeller, and Mr.

Blaxland's method of working, must be taken together; they are part and parcel of one patented invention; they are legally "one and indivisible," and must, in all fairness, be so considered.

The description which we gave of the invention in our last volume, did not point out with sufficient clearness the important part which the gear-work plays in the affair, and was also defective in several other particulars. We have thought it, therefore, due to the importance of the invention, to avail ourselves of the present opportunity to describe it anew, and with more completeness, in all its details; and to save the trouble of reference to the back volume, we have included in the accompanying engravings three which were formerly given.*



1.—*Of the Propeller.*

The principle on which Mr. Blaxland constructs his propeller, is thus clearly explained in his specification :—

"One or more inclined planes or propellers are to be affixed at right angles to a revolving horizontal shaft placed over the after part of the keel forwards of the rudder post, which inclined planes work in the water below the water-line, in an opening formed in the dead wood of the vessel, but without any bearing or journal beyond the inclined plane or planes, so as not in any way to be attached to the rudder post. In order to determine the angles at which the inclined plane or planes is or are to be fixed to the revolving horizontal shaft, I draw a straight line, the length of the circumference, as shown in the diagram, fig. 10, from *l* to *m* 56·54 inches; then I set out the angle at which I intend to set the first or outermost inclined plane, and raise a perpendicular from the length of the

* For the means of giving this more complete description we are indebted to Mr. G. Steinman, the owner of the *Swiftsure*, and part-proprietor of Mr. Blaxland's patent, to whom the highest praise is due for the spirit and liberality with which, regardless of expense and trouble, he has persevered in obtaining a fair trial for the invention which he has taken under his patronage.

circumference, and at that point where it intersects the angular line which is determined upon, will be the distance passed through at one revolution. Then I draw a line parallel to the base line, and in like manner set off the other different distances, as from *l* to *n*, 50·26 inches the circumference. I then find that an angle of 33° is necessary to give the same distance advanced, and in like manner I proceed to set out for the different circumferences or diameters required. I prefer, however, not carrying it further to the centre than where an angle of 45° would be required to give the distance. I rivet the inclined planes, which I prefer divided into three or more parts, each part being separately riveted on to an arm, as shown in fig. 7.

2.—*The Gear Work.*

The speed of the revolving shaft upon which the inclined planes are fixed is got up and maintained in the following manner:—

"I place an intermediate friction wheel between the larger driving drum, and the smaller driven drum, as shown at figs. 1 and 2, which friction wheel revolves with the driving drum, and is again borne and communicates its motion to the driven drum. I bring the friction wheel into or out of the line of centres by means of a screw as shown in fig. 2, whereby the strap or band *e*, which passes over the said driving and driven drums may be tightened or slackened as occasion may require. In order to keep the drums parallel to each other when the shafts are out of a parallel line, I leave a spherical boss upon the shaft, and make the drum in two parts, so as that the boss of the two parts of the drum may fit the boss on the shaft, and put them together by means of screws, so as to form an universal joint; and a clutch, or driving coupling, is keyed on to the shaft to carry the drum round, as shown at fig. 4. The strap or band may be made to pass upon the surface of the intermediate wheel, as shown at fig. 2; when it may be required for the propeller shaft to rise and fall with the tightening and slacking of the strap, a bearing is used as shown at fig. 9. I grind the part *h*, into the socket *i*, so as to make it watertight, but at the same time to move freely in and out of its socket and the part *h* may be kept up to the spherical part of the shaft by means of a spring or springs, but I do not consider it indispensably necessary that the propeller shaft should rise and fall, having in my experiments allowed the upper *shaft a only to rise* and fall with the *tightening or slackening* of the strap."

Explanatory Figures.

Fig. 1 is a section or side view of the after part of a vessel, showing the invention as used on board the experimental boat *Jane*; *a* is the main driving shaft from the engine; *b* the driving drum; *c* the intermediate friction wheel; *d* the driven drum; *e* the strap; *f* is a pipe carried to any convenient part of the vessel, through which a mixture of oil and tallow is applied to the gland or bearing where the revolving shaft passes through the vessel; the mixture being put into a cylinder, in which a piston is fitted and loaded with a weight so as to force it into the gland or bearing. The propeller is here shown with an undivided inclined plane.

Fig. 2 is a section through fig. 1, showing the mode of tightening the strap by means of the friction wheel and screw as applied on board the *Jane*; the letters in this fig. correspond with those in fig. 1.

Fig. 3 is a section through the stern end of fig. 1, but showing three series of divided planes, each divided into three parts.

Fig. 4 shows a mode of keeping the drums parallel to each other, when the shafts are out of a parallel line, with one intermediate friction wheel, and

Fig. 5 the same with two intermediate friction wheels.

Fig. 6 shows the strap and band when made to pass upon the surface of one intermediate wheel.

Fig. 7, is an end view of a propeller with four series of inclined planes, each divided into three parts.

Fig. 8 is an end view of the propeller used in fig. 1.

Fig. 9 shows the mode used for a bearing, where the propeller shaft passes through the vessel when it is required that the same may rise and fall.

Application to River and Canal Purposes.

On Tuesday, the 24th ult., a trial of the *Jane* was made in the River Lea, in the presence of the following gentlemen:—Ezekiel Harman, Esq., of Theobalds; Thomas Brewin, Esq., of Birmingham; W. C. Mylne, Esq., Engineer to the New River Company; Lieut. Webb, of the Ordnance Department, at Waltham Abbey; Mr. Austin, Engineer to the Ordnance Mills, Waltham Abbey; Mr. Griggs, Surveyor to

the river Lea, and Mr. Gunner, store-keeper to the Ordnance.

The boat was steamed from Enfield Lock to Ware, a distance of 14¾ miles and back, and proceeded with hardly a ripple in her wake, whilst a small boat towed by a powerful horse which followed her caused so much surge and commotion that her gunwale was frequently within an inch of the water. When the horse-drawn boat was made fast to the *Jane*, the surge and commotion ceased. The *Jane* remains at Enfield waiting a special general meeting of gentlemen interested in canal navigation, from all parts of England, which is to be shortly held there, to take the applicability of the Blaxland Propeller to Canal purposes, as well as other matters, into their consideration.

ON EELS AND EEL LINES—BY COL. MACERONE.

There is some confusion in the Latin terms for eels; *Anguis*, *Anguilla*, *Muræna*, being often applied to the same animal.

To avoid technicalities, I will observe, that in this country we have two kinds of eels; the small dark blue eel found in canals and muddy rivers, and the large silver eel abounding in the Thames, &c.

The *Muræna* is called in England lamprey; it is of a bright yellow brown with black streaks, much after the fashion of some serpents, and is thicker, in proportion to its length, than the common eel. In lieu of gills, it has seven holes on each side, which answer the purpose of separating the air from the water, like the gills of other fish. The only difference is in the division of the openings for the water into the gills.

The greatest supply of these *Murenæ*, or large lampreys, is about Puzzuoli, eight miles from Naples, where, it is said, that Lucullus had his marine fishponds, into which he cast the flesh of his offending slaves! I have never caught any lampreys of more than four pounds each. Like the smaller lampreys they have no bones, but only cartilage, and are exceedingly nutritious food. They have never been known to reside permanently in fresh water.

But the common eel is only generally known during its residence in our rivers, lakes, and ponds. Its natural history is very curious, and but little understood. The salmon, shad, grey mullet (*cefalo*), smelt, and some other fish, reside mainly in the sea, and only frequent the rivers for the purpose of spawning; but the eel brings forth its young in the sea, which soon ascend the rivers, wherein they remain until the age of propagating maturity. This age is about four years, when, in large rivers like the Thames, they have acquired the weight of from two to three pounds. At this period, upon the first autumnal floods, they hasten to the sea, never more to return into fresh water. Thus it is that they are then taken in such numbers, and all nearly of the full grown size, in certain wicker or reed apparatus placed across the streams.

In large lakes and waters that have no communication with the sea, eels are often found of a far greater size than in any river, because they are compelled to remain therein, and continue to grow. In the lakes of Albano and Nemi, near Rome, there are eels of ten to fifteen pounds weight. In the year 1827, an eel was caught in its attempt to escape from a lake in the centre of the island of Mauritius, which weighed twenty-seven pounds, and was presented to the governor, Sir Lowry Cole. On the coast of the Adriatic, is the city of Comacchio, in the Papal States. It is surrounded by extensive lakes and swamps, with several estuaries to the sea. The staple article of trade at Comacchio consists of eels. It is in October and November that the great migration of eels takes place. The class of mature ones, *i. e.*, from three to five pounds, hasten to quit the lakes for the sea. In order to intercept them, meandering labyrinth-like constructions of slender reeds are established at the estuaries, into which the eels freely enter, but cannot find their way out. No small ones ever attempt this departure. The quantity thus taken is prodigious. The entire population of Comacchio and its dependencies subsist mainly on the produce. The labour is divided into sections. One set of men build the labyrinths, and take the eels. Another section, including many women, chop them into pieces and roast them. Others make barrels for their package. Another set pack them up with bay-leaves, salt, and vinegar.

Lastly, another class collect the oil which falls from the roasting eels, of which a large quantity of good soap is made. A number of clerks and exporting agents keep the accounts, the amount of which is equitably divided amongst the community. I have been told that the value of the eels of Comacchio exceeds 40,000*l.* per annum, which appears to me not overrated, when we know that there is scarcely a town or village in Italy that does not consume scores and scores of barrels of them every year, especially in Lent. Many millions of persons make a point to sup upon these eels on Christmas-eve. They call them "*Capotini.*" Spain and Portugal also consume a large quantity.

Such is the anxiety of the eel when mature to quit the brooks and rivers for the sea, that I have often taken them when crossing a field of wet grass, which they can accomplish to a great distance.

Near Naples is the celebrated lake of Agnano, in which no fish existed when I first knew it, in 1806. Its banks are generally covered with reeds and rushes. Close to this is the lake Astroni, at the bottom of an extinct volcanic crater. The crater itself is about four miles in circumference, filled with the finest oak and chestnut timber. A strong wall crowns the summit of the bowl or "crater," to keep in the numerous wild boars, deer, and hares which inhabit it. The beautiful little lake in the centre teems with carp, roach, and eels. Of these, I transferred many hundreds to the lake of Agnano. Observing that the banks of the latter lake swarmed with myriads of frogs, I procured many pails full of young eels about as big as a straw, and cast them into the lake. Frogs are the favourite food of eels, and here each eel might, in summer, eat a thousand a day. The eels thrived prodigiously, as did also the carp and roach. These young eels I procured from Patria, the ancient Liturnam, and, including carriage, they cost me about a shilling a thousand. I have no doubt but that with such abundant frog food, and such an extent of water with no escape to the sea, there are now thousands of eels of very large dimensions. Six years after my colonising operation, I caught several that weighed three and four pounds each. The carp had grown to ten pounds; the roach to above a pound. Pike and perch would have thriven wonderfully in this lake, but I could not easily obtain any.

Now a few words on the generation of the eel, which I believe is a point still unsettled amongst naturalists. One hot summer's day, in June, 1820, as I was proceeding up the river Thames from Ditton to Hampton, my attention was much excited by an extraordinary appearance of the water on each margin of the river. For a yard or two in breadth it had all the appearance of soap suds. On investigation I found the phenomenon to be caused by countless millions of young eels, about as thick as a straw, wriggling their way up the stream, where they had to contend with the least resistance of the current.

On arriving at Hampton Court, a vast dense column of these young eels diverged from their course, and passed up the river Mole. In the lock it was difficult to say whether there was more water than eel! Hundreds of boys and women were busy with cullenders, saucepans, sieves, &c., taking out thousands at a dip, with which they told me they made most excellent pies and cakes, with batter. Arrived as far as Hampton-common, I found a vast crowd assembled to witness a prize-fight between Scroggins and Turner, and there I met with my old acquaintance Captains Bastard and Horner, of the R. N., to whom I pointed out the eel phenomenon. My fisherman and others called it *Eel-fair*, and told me that it only occurred once in three or four years. Any pond might have been well stocked by one dip of a bucket. I had occasion to stop at Hampton to dinner, when I took leave of the Eel-fair, which still pursued its course.

I have above remarked that when eels arrive at a certain breeding size, they quit the river and hasten to the sea. This takes place in the autumn, after rain. The Thames' fishermen place certain large baskets, called "*bucks*," across the side waters, into which the eels are conducted by the stream, and captured. It is my perfect conviction, founded on much and long observation, that the eels which get to the sea never return to fresh water, but therein breed, and, supplied with most abundant food of small fish, become what are called congers. Congers agree with the river-eel in the number of their vertebræ, their teeth, fins, and every particular except

colour being lighter; but we all
that the colour of fish is always in-
ed by that of the water, and of the
n on which they live. Pike and
, for instance, taken on a bottom
een weed, will be of a beautiful
; when taken off sand or mud, they
rown and dull. The dace of the
, instead of the beautiful silver hue
se of the Thames, are of the dull
like texture of the Tiber's waters
ottom.

o not know whether the majority
uralists incline to the oviparous or
viviparous generation of the eel.
the lamprey is oviparous, I have
roof. But I can show that the eel,
it the large "silver" eel, is vivip-
In proof of this, I beg atten-
the following facts.

September, 1825, I was fishing at
erton, a village situated between
n and Chertsey. A fresh of water
g down the river, I caught many
large silver eels, and in order to
them at my disposal when required,
ed about half a dozen of them in a
rly constructed basket in the well
r punt. I did not attend to them
me weeks, but upon opening the
t to take out one or two for dinner,
agreeably surprised to find several
of young eels, thinner than a straw.
was in the evening, and the next
he greater part of them had ab-
ed through the interstices of the
r-work, and the holes in the punt's
However, I secured about fifty,
ut them into a pond belonging to
Lucan, at Laleham, where, by the
ey will not have remained, as the
has a communication with the
es, and so to the sea. By this time
tle eels have become huge congers,
ent up several eel-fairs such as I
above described.

th respect to the best method of
ng eels by hook and line, I intend
ak fully in a work I shall publish
I may have the means, intitled "An
al art of Angling, with new and
ved methods of constructing fish-
ds, and all sorts of tackle." But,
ssant, I may here observe, that
st baits for eel night-lines, are por-
of skinned frogs. The small fish
t pick these off the hooks as they
bworms; and the whiteness of the
raws the attention of the eel towards
it. An eel night-line consists of a main line as thick as a quill, twenty or more yards long, according to the extent of the waters fished in. A diagonal position is generally the best. First, because it embraces a more extended line; secondly, because when in search for food, the eels are prone to prowl near to the banks. The main line should be woven, not twisted. The hook lines should be about two feet long of plaited silk, and attached to the main-line by a slip-knot, about four feet apart. When a twisted main-line is used, the twisting and untwisting of it caused by the water, winds the short hook lines up to the hook itself. When you take the eels off the line, just pull the slip-knot, and let the eels fall into a recipient with the hooks within them. At your leisure, you may then feel the position of the hook, and passing the point outwards, draw it and the hook-line, like a needle and thread, from the side or throat of the eel.

The eel is the most voracious of fresh-water fish. They will greedily devour dead animals or their intestines, which a pike or a perch will not touch. Hence, in some parts, eels are caught by putting chickens' guts into a faggot, and suddenly pulling it up in the morning, when many eels are found entangled in the sticks.

About eighteen miles from Naples, is the celebrated palace of Caserta, the largest and most beautiful in the world. At about a mile from the back of the edifice is a range of rocky hills, appendages of the Appenines. A most stupendous aqueduct brings thither a stream of crystalline water from a distance of twenty-six miles, passing in its course across the valley of Maddaloni over a bridge of three tiers of arches 140 feet high. This water falls by a beautiful cascade into a rectangular lake, extending to the palace, being, as I have said, about a mile in length. Besides trout, carp, perch, and tench, there are in the lower and stiller parts of the lake, an immense number of large eels. To minister to their eel-ships' habits, a number of earthen tubes, like chimney-pots, are piled here and there along the bottom, in which they usually reside during the day time. But in the summer, at midday, a man arrives with a wheelbarrow full of frogs to feed them. No sooner do the eels hear the sound of the wheelbarrow, than they sally forth from their pots, swimming

about near the surface of the water with frantic activity. The feeder throws the frogs into the water with a shovel. Two or three eels catch hold of the same frog and tear it to pieces. In a few minutes the whole are devoured. These eels are much larger than any found in European rivers, by reason of their confinement, as above alluded to. The largest eel I ever saw taken in fresh-water, came from the lake of Nemi. It measured ten of my feet in length. I had not at the moment any means of weighing it, but I think it must have weighed from twenty-five to thirty pounds. I bought a piece of four pounds, which was very fine eating. I had it roasted, and treated with spiced vinegar.

All that I have further to say about the eel appertains more to the art of angling than to the natural history of the fish. But I will conclude this article with an anecdote that will be acceptable to antiquaries as well as to naturalists. Fishing one day in the Lake of Nemi, I prepared some eel-lines, baited with parts of frogs, to lay previously to retiring home. I asked my boatman which was the best place to lay them? He replied, "Close to the old palace." "Old palace," said I; "I see nothing of the sort near the water. Only a few white cottages in the shelving-wood, and some villas on the hills around." "I mean, sir, the old sunken palace constructed by the Emperor Claudius (or Nero) which, floating on the lake, was transferred from one side to the other, according as it might be protected from the wind by the high crater margins." Being taken to the spot, surely enough I saw under the crystalline water a barge-like building, apparently about 200 feet long at least, and in seemingly good preservation. This, it appears, was the resort of the eels and fish alluded to by my fisherman. It may be well conceived how ardently I then wished for a diving-bell! I determined to have one constructed, but military and political events fell so thick around me as to put the affair out of my power and contemplation. I have given the same account of the sunken palace, in the first volume of my Memoirs, published by Cunningham, of No. 1, St. Martin's-place, Trafalgar-square. Several reviewers turned my account into ridicule, *quasi*, accusing me of romancing. But "there is balm in Gilead." Twelve months *after* the publication of this my account, the *Penny Magazine* gave a lengthened history of this sunken palace, and of two Italian literati having dived to inspect it. They describe it as 200 yards long, fifty feet broad, and twenty high. It appears that their diving apparatus was very imperfect. They could not penetrate into the interior, and their skins were sadly wounded, by myriads of those little fish called "stickle backs." Were our celebrated diver Dean, or those employed on the *Royal George* to be employed, who can tell what very important and valuable pieces of antiquity might not be found?

When eels are cooked they should not be skinned, but only well scoured with sand and salt to free them from the slime.

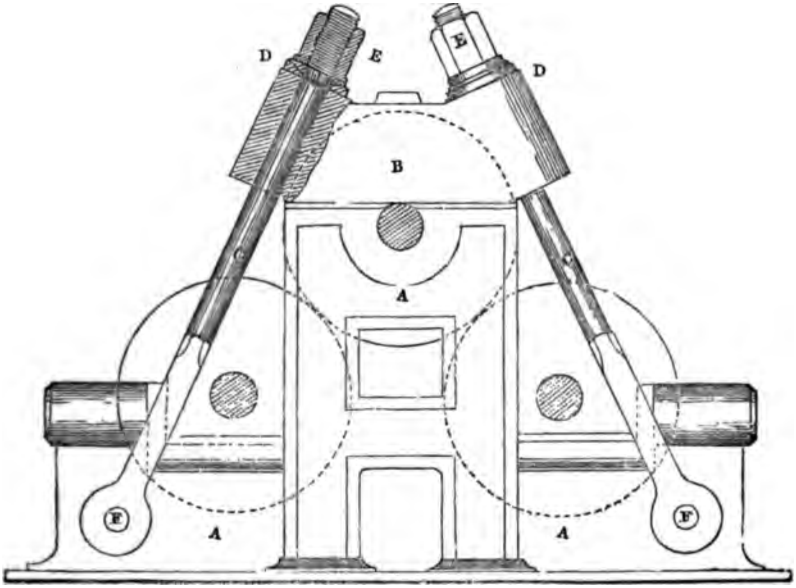
F. MACERONE.

HUNT'S PROPELLING AND STEERING APPARATUS.

The *Infant Prince*, a small steamer, of about fourteen tons, and 12-horse power, which has been fitted up with this apparatus, has been making several experiments in the river during the present week. The peculiarity of this apparatus, which was fully described in No. 880, (June 20, 1840,) consists in its combining the means of propelling and steering in one, and thus dispensing with the usual rudder entirely. Mr. Hunt applies his propellers at the stern, and under water, in the same way as Mr. Blaxland, whose invention we have noticed in a preceding page, but claims no particular form. The power is communicated from the engines to the propeller by toothed wheel-work, while Mr. Blaxland makes use of drums and straps. The usual rate of speed of the *Infant Prince* is, we are informed, about eleven miles an hour. On Tuesday last it performed the distance between Gravesend and Blackwall in one hour and thirty-five minutes.

IMPROVED GLAND-BOLTS FOR SUGAR-MILL STANDARDS.

(Registered pursuant to Act of Parliament.)



Sir,—I send for the inspection of your readers, but more particularly such of them as are connected with sugar machinery, the accompanying sketches of an improved method of constructing the gland-bolts for sugar-mill standards, and placing them in such a position as to give the greatest possible strength, without increasing the weight of material. Another advantage attending this improved position, is that the line of strain is always parallel with the gland-bolt, in consequence of which, the frequent breakages which occur, and the delay consequent upon them, are entirely prevented. The gland-bolts are provided with universal or self-accommodating washers which keep the nuts in their proper position at whatever angles the gland-bolts may make with the cap or gland.

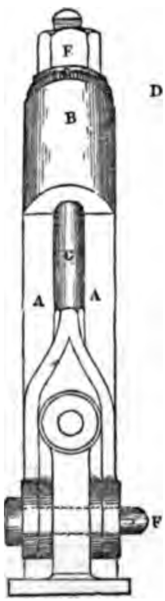
I am, Sir, your obedient servant,

G. Fletcher, Engineer.

Brook-street, Lambeth, May 30, 1841.

Description of Engravings.

A A, sugar-mill standard; B, cap or gland for ditto; C C, the improved gland-bolts; D D, the universal washers, one *of them shown in section*; E E, nuts of gland-bolts; F F, bolts for attaching the gland-bolts to the lower part of standard.



BOOKS ON ELECTRO-METALLURGY.*

Not more than three years have elapsed since the first application to the mechanical arts of the chemical discovery, that metals can be precipitated from their solutions by the agency of the voltaic battery, in solid plates of perfect purity, of any thickness, and of the forms of the bodies on which they are deposited; and already there is scarcely a branch of manufacture connected with working in metals, which has not benefited by it. The many additions to our technical nomenclature to which this new process has given rise—as Electrotype—Electrography—Electro-gilding—Electro-plating—Electro-tint, &c., are of themselves evidences of the multiplicity of uses to which it has been found subservient, and the extraordinary rapidity with which it has been turned to account. We doubt whether there is another such instance on record of a new art springing so quickly into full maturity, and being caught up so eagerly by so many different classes of persons.

On a former occasion (see vol. xxxiii. p. 20,) we stated our reasons for assigning to Mr. Thomas Spencer, of Liverpool, in preference to every other claimant, the merit of this exceedingly valuable addition to our manufacturing processes; and nothing has since transpired to induce us to modify in the slightest degree the opinion which we then expressed on this head. But though Mr. Spencer's title to be considered as the father of electro-metallurgy, is now very generally recognized by the public, we are sorry to see that there still exists in certain scientific circles the same dogged reluctance, on which we before animadverted, to do justice to the humble "Carver and Gilder of Liverpool"—for no better reason, that we can discover, but the sin of being humble. We have now before us two publications on the new art, which may be considered as typical of these opposite states of feeling. In one, which is a Birmingham production, intended, like most Birmingham wares, for the million, and written by a person, who, like the hero of his subject, boasts the license of no learned society to be useful to his fellow men, the art is honestly admitted to have "*proceeded from the hands of Mr. Spencer,*" and is described as it came from his hands with considerable fairness—not in a perfect state, of course, (for what art was ever perfect all at once?) but so far matured as to lead almost inevitably, to all the improvements which have followed each other in such quick succession; while, in the other, which is a London production, dedicated to the Consort of her Majesty, and written by a Fellow of the Royal Society, the name of Mr. Spencer is never once mentioned! A more flagrant instance of injustice and of venal subserviency to paltry class prejudices, we never met with. The offence smells the ranker, that it has been perpetrated by an individual, who, though not without some scientific eminence, owes all of that which he possesses, to having laboured assiduously in the very field of experimental investigation opened up by the genius of Spencer—who, but for the demand for a cheap and simple precipitating apparatus, occasioned by the extensive application of electrical science to the arts and manufactures, induced by Spencer's example, would never probably have invented the battery, with which his name is identified—and who, being himself an inventor, might have been expected to regard with some degree of fellow feeling, the claims of a brother inventor, instead of conspiring with an envious and scornful clique, to discredit and crush him.

Where there is an act of larceny—great or petty—to be screened or palliated, falsehood is ever sure to be at hand to lend its aid. "The idea of electro-metallurgy," says Mr. Smee, "*appears* to have been *first suggested* by the use of Professor Daniell's battery, for during its action the outer copper vessel, which is the negative metal, becomes coated with an additional layer of metallic copper." *Where,* Mr. Smee, does this appear? In no other page we are certain of the history of electro-metallurgy that ever was written. The fact of the deposition on the outer copper vessel, was, it is true, noticed by Professor Daniell, who even went so far as to point out to his pupils that the precipitated layer of metal exhibited im-

* A Manual of Electro-Metallurgy. By George Shaw, 49 pp., 8vo., Groombridge, London.
Elements of Electro-Metallurgy, or the Art of Working in Metals by the Galvanic Fluid. By Alfred Smee, F.R.S., Second Edition, Revised, Corrected, *Considerably* Enlarged and Illustrated with numerous Engravings. Parts I. II. Palmer, London.

ıns of any marks on the matrix ɜxtreme fidelity, (so close did he the verge of the great discovery ıt hitting on it); but what the au- f the rival treatise before us, Mr. states on this head is not less true, y, that the learned professor "*never ht of applying this fact to any purpose*," p. 16. Professor Da- imself has nowhere alleged that he ınd is by far too honourable and . a man to feel indebted to Mr. for the false honour which he parasitically thrust upon him.

Shaw gives a summary of Mr. er's part in the affair, which, though ht reasonably have been in a more endatory vein, presents in a few the literal truth of the case. After r quotations from Mr. Spencer's ıed papers on the subject, he thus ds:—

e learn by the above extracts that ›encer was experimenting with a vol- rangement similar to that of Professor l, and that in detaching the precipita- ›per, he found, as that gentleman and had done, that every impression was rred to the precipitated copper. It , accident presented the fact to him in h more forcible form than that in it had been presented to others; the of a proper piece of copper to com- be arrangement occasioned Mr. S. to ıce a penny as a substitute, and on ing the precipitated copper, he found ıd and letters distinctly marked upon that a *fac simile* of the coin was pro- quite unintentionally on the part of pencer, and this new application of ltaic battery was presented to him in ner so forcible that it was impossible glect it. Mr. Spencer pursued the t, and so far succeeded in his experi- as to be able to furnish processes by medals and plates may be copied, and ıon-conducting substances coated with ."—p. 17.

it so—since the fact is so—that it y "accident" Mr. Spencer made scovery, still it was an accident of ıappy sort which happens to but two men in an age, and which by ıiversal consent of mankind entitles o whose lot it falls, to be looked with all the respect, honour, and ıde due to the chosen instrument of reat revelation by Nature to her en. It was just such an accident t which led to the discovery of the only basis of all sound philosophy, the theory of gravitation. But as the fact of the fall of the apple was not merely observed by Newton, but reflected and reasoned on by him, till he reared upon it that glorious superstructure which takes in the entire universe; so in like manner Spencer saw in the *facsimile* which he accidentally obtained of the penny piece, a thing which was more than simply curious—to be shown about and talked about, and then no more; he saw at once that it was but a sample from a mint that was inexhaustible — he "pursued the subject," as Mr. Shaw states—he pondered it well—he made experiment after experiment, till he was able to furnish processes by which medals and plates, as well as penny pieces, may be reproduced in copper by the voltaic agency. Here, at least, there was no accident; Mr. Spencer did what we cannot be sure many men would have done under the same circumstances—he turned a most fortuitous incident to admirable practical account. One metal he brought quite under subjection to the new power; and but left it to others to add the rest.

Mr. Smee is of course perfectly well aware of all this, and were he not more actuated by a desire to curry favour with those by whom Spencer has been so shamefully slighted, than by sentiments of justice and generosity, he could not possibly have passed Mr. Spencer and his services over so entirely unnoticed as he has done. It would be to ascribe, however, far more importance to Mr. Smee's silence than really belongs to it, to suppose that it can be of the least permanent injury to Mr. Spencer's reputation. The only person certain to be damaged by it is Mr. Smee himself, whom it exhibits in the unenviable light of a person possessed of all the will to extinguish another's well-earned fame, but happily without the power.

The reader will not expect us to recommend him to seek for the "Elements" of electro-metallurgy in a work so destitute of the first great element of all philosophical enquiry, *truth*, as that of Mr. Smee. Willingly we could not do so; and fortunately there is no occasion. The first edition of Mr. Smee's Elements is confessedly so defective, that to adapt the second—Parts I. and II. of which are now before us—to the advanced state of the art, the author is obliged to promise, be-

sides much general revision and amendment, the addition of "one-third original matter." But while Mr. Smee is revising and amending and adding, and has as yet not reached half way in his task (for this new edition is to consist of seven Parts,) Mr. Shaw has stepped in with a "Manual" of the art, so comprehensive and complete as to leave Mr. Smee nothing of importance to tell. The student of electro-metallurgy will find in Mr. Shaw's small work every information and assistance that is to be procured through the medium of books; the principles of it expounded with correctness and clearness, though of necessity with brevity, and the practice of it in all its numerous ramifications traced with a judicious and discriminating hand. It will not of itself make a man a perfect electro-metallurgist, but combined with that knowledge which experiment alone can impart, it will certainly enable any one (which is all the author could hope to accomplish) to practise the art with workmanlike proficiency and success.

Mr. Spencer, as we have seen, effected by the electric agency the precipitation of copper only, and left to subsequent experimenters the honour of bringing the nobler metals under its dominion; or to state the case more correctly, perhaps, he was joined in the pursuit by others whose success was greater, only because Spencer had cleared the way for them. Works of art are now multiplied in gold and silver with as much facility as in copper. The following instructive sketch of the means by which this is effected we quote from Mr. Shaw.

"Platinum may be precipitated from its chloride, gold from its combination with chlorine, iodine,* bromine, and cyanogen,* or from its oxyde dissolved in potassa or soda, and silver may be precipitated from its cyanide,* acetate, sulphate, or the solution of most of its salts in ammonia.

The chloride of *platinum* is made by the addition of spongy platinum, or the ordinary metal in small pieces, to nitro-muriatic acid or aqua regia; the latter is composed of one part of concentrated nitric acid, and two parts of muriatic (hydrochloric) acid. Chlorine is liberated, and is the real solvent.

The chloride of *gold* may be prepared in the same way, and from the concentrated solution, oxyde of gold may be precipitated by the addition of caustic potass. The bromide of gold is formed by the simple addition of gold to bromine. The cyanide of gold is easily procured, by dissolving either metallic gold, or the oxyde of that metal, in a solution of cyanide of potassium. If metallic gold be used, it must be in a state of minute division, and its solution may be promoted by the application of heat: it is, however a very tedious operation. The oxyde dissolves very readily. Two ounces of the cyanide of potassium may be dissolved in a pint of water, and the oxyde of gold added till the solution will take up no more. The cyanide of potassium may be made in various ways. It may be formed by the direct union of its elements; if potassium be heated in cyanogen it burns with a beautiful flame; cyanogen is absorbed, and the cyanide of potassium formed. This process cannot be used for its production in large quantities. The simplest and most economical mode of forming it is to heat the salt known by the names of prussiate of potass, ferroprussiate of potass, and ferrocyanide of potassium. It is known in commerce as prussiate of potash. It should be put in a close vessel, and heated to redness, and, after cooling, the addition of water will dissolve away the cyanide of potassium, which may be obtained in crystals by the ordinary process. The latter, however, is not necessary, as it must be used in the state of solution.

The compounds from which *silver* can be reduced are thus prepared. The cyanide, by the addition of oxyde of silver to the solution of cyanide of potassium, the acetate by adding oxyde of silver to acetic acid, or a solution of acetate of potassa to the solution of nitrate of silver. Sulphate of silver may be procured by boiling silver in sulphuric acid, or adding sulphate of soda to nitrate of silver, and the carbonate is precipitated when carbonate of potassa is added to a solution of nitrate of silver. The latter is prepared by dissolving silver in nitric acid, diluted with an equal quantity of water. The oxyde of silver is prepared from this solution by adding a solution of caustic potass, or soda, or lime water. An olive coloured precipitate falls, which is the oxyde. The carbonate of silver and most of the other salts of that metal, which are insoluble in water, dissolve very readily in a solution of ammonia, and the metal may be reduced from such solutions; but they possess no advantages; and the fact, that the detonating compound called fulminating silver is produced by the solution of the salts of silver in ammonia, is sufficient to induce the experimenter to reject them.

The nature of the moulds or surfaces on

* The reader must bear in mind that the use of these salts for plating or coating metallic bodies with a film of gold or silver has been patented.

the deposit is to take place requires on. There are very few of the salts l and silver which do not suffer de- sition by contact with other metals. if a piece of copper, brass, &c., be sed in a solution of any of these salts, ipitation occurs upon it, sometimes in 'm of a perfect layer of silver or gold, others in the form of a dark powder. ıg such metals it is advisable to make ; connexions with the battery before ucing the surface on which the deposit take place, into the solution. When course is adopted, the mould or sur- ceives a thin film of gold by voltaic , immediately on being introduced, iere is very little action upon it. If ecaution be not taken, the precipita- lluded to will take place, and the sur- receive the deposit will be injured : ch metal will be dissolved from it, as ivalent to that deposited upon it. Al- ı the whole of the salts of gold before oned may be reduced for the reduction t metal upon a surface of gold, and of silver upon a silver surface, yet, very precaution, many of them are r unfitted for reduction upon baser ı, such, for example, as copper, brass, ı. Those least objectionable, are the le of gold, and the solution of its oxyde assa or soda, and the cyanide of silver s ammoniacal solutions. The cyanide rer possesses no action on iron, and e therefore advantageously used for luction upon that metal."—Manual,

e platinized silver battery invented r. Smee, of which we gave a des- on in vol. xxxii. p. 540, is, we be- more extensively used than any , but Mr. Shaw gives some good ns for considering it not so well ed as that of Professor Daniell to eduction of the noble metals.

'he character of the deposit of gold or is influenced by the state of the cur- mployed, as in the case of copper, and marks made on this subject, when treat- ' the reduction of copper, are applicable ıeral to the reduction of other metals. are, however, two or three circum- s in relation to this subject, which re- especial attention. The solution of le of silver cannot have its conducting : increased by the addition of sulphuric as decomposition of the salt would lace ; hence, the only means we have gulating the flow of electricity are the ity of the cyanide in the solution, its rature, and the intensity of the bat- The solution of two ounces of the *le to a pint of water*, and saturated with oxyde of silver, answers exceedingly well, and as the maintenance of an elevated temperature is very inconvenient, it is necessary to use a battery possessing considerable intensity: three or four cells of the acid battery will answer the purpose ; but a Daniell's battery is far more convenient, and cannot be too strongly recommended for the purpose in question. When the arrangements are properly made, the deposited silver is of a beautiful whiteness, and tolerably smooth on its surface. If the flow of electricity be too great, the silver is of a dirty yellow or brown colour. The remedy is so obvious from what has been already said, that it is unnecessary to do more than thus allude to it."—Manual, p. 48.

For beginners, also, Mr. Shaw pronounces Daniell's battery to be greatly superior.

"The experimenter is strongly recommended to use, in his early experiments, a Daniell's battery in preference to every other. He is much less likely to fail in his operations by its use ; and, from the extreme regularity of its action, the character of the deposit is not likely to change, even during a long experiment. As a general rule, it may be remarked that there is greater danger of failure from a deficiency of power than from excess ; the black deposit occasioned by the latter is at once apparent, but the brittle metal produced by the former may more easily escape observation."—Manual, p. 36.

The following remarks on batteries in general, are also well deserving attention—

"Before dismissing the subject of voltaic batteries, we would remark, that whatever form is given to an instrument of this kind, the amount of electricity generated by the consumption of a given amount of zink is the same in each ; they differ only in the rapidity with which the development of the voltaic power takes place. In the invention of Daniell a flow of electricity of extreme uniformity is produced. We have a torrent of surprising intensity, but of transient duration, in the battery of Mr. Grove ; and a copious flow of electricity of moderate intensity in the common acid battery and that of Mr. Smee : but we repeat (for it cannot be too strongly urged upon the reader) that in all these instruments a like amount of this subtle agent is obtained by a like consumption of materials, the intensity alone being affected by the arrangements of Daniell and Grove. In Smee's battery this is not at all increased ; the mechanical form of the surface of the negative plate only facilitates the escape of the hydrogen therefrom."—Manual, p. 15.

The voltaic precipitation of copper has been turned to useful account for many other purposes besides the multiplication of coins, medals, &c. One of the most remarkable of these is the production of plain copper plates for engraving, with the following account of which we must conclude.

"Plates for engraving may be made by depositing the metal upon a burnished piece of copper. In this case, the precipitated plate will have a burnished surface like the copper on which it is deposited; or it may be precipitated on a plate not so prepared, and be afterwards treated exactly as ordinary copper is for the use of the engraver. Copper-plates intended for etching, when made by the electrotype process, are so superior to those of ordinary copper, that there can be no doubt the former will very soon completely supersede the latter. The electrotype metal is absolutely pure, and hence, in all chemical processes, is more uniformly acted upon than any other. The electrotype itself will demonstrate this. The copper forming the positive pole in the decomposition cell invariably presents a black surface during its solution, and a quantity, more or less, of scaly matter, consisting of charcoal and other impurities, is invariably left behind where thick plates are thus operated upon; but, if a piece of electrotype copper is used as a positive pole, its surface does not for a moment lose the beautiful orange colour so peculiar to it; and, after the largest masses have been dissolved, not a particle of impurity is left behind—nay, the beautiful transparency of the liquid is not in the slightest degree impaired. Hence it is that, in the process of etching, the common or impure metal proves a source of anxiety, and often disappointment to the engraver, while he uses that precipitated by voltaic agency with the absolute certainty of success. When the acid is applied to the former, its action is frequently intense in one place and feeble in another, and the etching is of necessity irregular; but with the latter the utmost uniformity of action prevails, and a corresponding regularity in the product results."—Manual, p. 37.

THE SMOKE NUISANCE.

At a Public Meeting held last week at the Victoria Gallery, Manchester, the Rev. Dr. Molesworth in the Chair, it was resolved to establish a "Manchester Association for abating the Smoke Nuisance."

Mr. Henry Houldsworth, who addressed the meeting at great length and with much ability, stated that he had had Mr. Williams's apparatus under trial for six months, and that it had diminished the quantity of smoke produced by full three-fourths. Indeed, he had no doubt that, by proper attention and a little judgment on the part of the fireman, nine-tenths of the smoke might be prevented. In answer to a question put by the Chairman as to the saving in fuel resulting from Mr. Williams's plan, Mr. Houldsworth said, "I can state, with very considerable confidence, that there is no excess in the consumption of coal. I must say that we have been partial smoke-burners for twenty years; so far back as the time of Mr. Josiah Parkes, who, it will be remembered, did something on this subject, we have admitted air into our furnaces in two places; but, not understanding the principle as well as now, we did not admit it in the most judicious manner. But when Mr. Williams examined our furnaces, he at once said, 'I cannot expect to save so much in the consumption of fuel here as in some places, because I see you already manage your furnaces much better than most that I have seen; but I shall expect to save about 15 per cent.' Now, we find that we actually do save 5 per cent. In the last month, I find that the quantity of coals which we consumed was 60 tons less than in the same month of last year; and I am not aware of any cause for this reduction but the change in the management of the furnaces."

Mr. Hall.—I should like just to ask Mr. Houldsworth, as he says he believes there is no excess in the consumption of fuel on Mr. Williams's plan, whether he means to say that there would be any saving?

Mr. Houldsworth.—I have stated that we have saved about 5 per cent., but whether we are to attribute it to that or other causes, I cannot say. I know of no other cause to which I can attribute it; but the saving is so small that I should not feel myself strongly justified in saying that there was any saving. In our case, we have burnt, in one month, 5 per cent. less than in last year; and I am not aware of any other change that has been made.

Mr. Hall.—I am much obliged to Mr. Houldsworth for his admission of that fact.

In reference to Mr. Hall's plan for the prevention of smoke, Mr. Houldsworth observed:—"Mr. Hall also introduces the atmospheric air in such a position as to cause it to mix with the gases, and produce the same effect; but I will say this, that there are certain conditions of the fire when a uniform admission of air, which is the principle of both these inventions, does not entirely prevent the smoke. I find, from my own experience, that this is the case when the fire is low; our fire burns for eight or ten hours, but twice a day it is essential that the fire should run down, in order that it may be cleaned out; and this

y done at the dinner hour, when the is off. Accordingly, the engineer , at eleven o'clock, to fire less heavily; lve o'clock he opens the doors, as much able him to check the fire during the r-hour, as, at the same time, to clean re, that is, to draw out the cinders. he has done this, and is preparing to gain at one o'clock, he has to get up am. If he were to throw a great mass ld coals into his furnace when in this instead of raising the steam, it would ut his fire; the consequence is, he is d to throw on a few shovelfuls first. ommon state of the fire then admits a ent supply of air through the bars to ne with the smoke; and the conse- e is, if we admit air, by Mr. Wil- s apparatus, through another part, we mass of air in that part, and that air, d of burning the smoke, actually pro- smoke; because it is essential, not that the atmospheric air should mix the gases, but that there should be, at int of mixture, a sufficient degree of to ensure combustion; and if it go that, the admission of air becomes a of the smoke. But I say this only while the fire is in this weak state; so rom about half-past eleven to half-past we do make a little smoke; at any period of the day we make no smoke; n that ground I say that at least three- s of the smoke may be got rid of. lause.) I think it but due to Mr. Hall, g made so much mention of Mr. Wil- 's invention, to say that Mr. Hall ap- to me to meet the objection of cooling the furnace in some measure, because ploys hot air. He makes use of the after it has left the boiler to heat the hich he is about to admit into the fur- ; and the consequence is, that he may air of a high temperature without the of cooling down the gases; and, as far it goes, it appears to me to meet one tion which has applied to Mr. Wil- 's plan. Another objection, however, sed to this, in consequence of heated cupying more room than air in a cold ; but, with regard to that, it is a matter perience on which I cannot speak."

ACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

SEPH CLISILD DANIELL, OF TIVER- MILLS, GENT., *for improvements in anufacture of manure, or a composi- o be used on land as a manure.* Enrol- Office, April 7, 1842.

. Daniell makes use of a vast variety stances, as *straw, chaff,* husks, weeds, vegetable rubbish of every sort, asphalte, pitch, tar, graves, offal, carrion, &c. The hard and lumpy he grinds to powder, or reduces to powder by subjecting them to the action of some caustic alkali. The soft and liquid he mixes with the dry, or with fine earths. And each manure, when rendered fit for use is deposited in the ground with the seed, by means of a drilling machine, or scattered broad-cast fashion.

The *patent* of Mr. Daniell is for "*a* composition to be used on land as *a* manure," but his specification describes a great number of compositions, all made of very common materials, and made after modes, all more or less in common use. It is impossible that such a patent can stand good.

JOHN PETER BOOTH, LATE OF HATTON-GARDEN, LONDON, BUT NOW OF CORK, FEATHER MERCHANT, *for certain improvements in the manufacture of a substance, or compound fabric, which will be applicable to the making of quilts, coverlets, and wadding for purposes of clothing and furniture.* —Rolls Chapel Office, April 19, 1842.

These improvements are stated to consist in the application to quilts, coverlets and wadding, used for the purposes of clothing and furniture, of down, in the following manner—"The down may be obtained from any bird or animal, but I use in preference the down obtained from goose feathers. After the down has been properly dressed and prepared in any of the methods usually adopted for such purposes, I arrange it in a layer of a convenient thickness, and place it within a case or covering consisting of two sheets of any suitable material. When the down is properly placed and arranged in this case or covering, it is retained therein, and in its proper situation by stitching, or quilting. After the down is properly secured in the manner above described, within its inner case or covering, the quilt, coverlet or wadding thus produced, may be covered with any ornamental fabric, such as satin, silk, velvet, chintz, or other material, according to the purpose to which my improved wadding is intended to be applied."

The claim is, 1. To "the application of goose down under two covers, the under cover to be quilted, or otherwise secured, and the outer, or ornamental cover stitched or connected to the inner in any convenient manner, for the purpose of making quilts, coverlets, or similar articles of furniture."

2. "The application of down of every description, to be applied in the manner above explained, to every purpose of clothing where warmth is required, as an improved material for, or mode of wadding garments."

The notion of attempting, at this time of day, to establish a monopoly of the use of down for wadding is amusing. Is it to

make the thing more characteristic that the patentee declares his preference for *goose-down*? Will not down of *gulls* do as well?

WILLIAM PALMER, OF SUTTON-STREET, CLERKENWELL, MANUFACTURER, *for improvements in the manufacture of Candles.* —Enrolment Office, May 9, 1842.

These improvements are four in number.

The first relates to the wick, which is to be so prepared, as hereafter explained, at one portion of its surface that it may be introduced into the candle in a straight line, and yet have the property of turning out from the flame. If a wick be so prepared on one side, as to produce an inequality by causing it to be made more or less stiff, or more or less combustible, there will be a tendency in the wick to bend out from the flame. The most simple means by which such inequality can be produced is stated to be by impregnating one side of the wick with common paste or starch, which gives stiffness to, or reduces the combustibility of one portion of the surface of the wick, and so alters the uniformity of the wick, as to produce a preponderance in one direction. The claim under this head is, to "the mode of manufacturing candles by preparing the wicks by applying a suitable material or materials to one surface of a wick in order to cause it to bend out from the flame when burning."

The second improvement consists of a new instrument to facilitate the production of wicks into candles. This instrument is a long piece of wire, with a small nick at one end which carries the top of the cotton, or wick, the two ends of which are then brought down to the bottom of the instrument and there secured, first one and then the other by a clip provided for the purpose, and made by turning round the lower end of the wire. The instrument is to be withdrawn when the candle is made. When the improved wicks, before described, are used, the wire will be found very useful, it is said, to keep them separate. The claim is to "the mode of forming an instrument to hold wicks for candles, whereby the ends of the wicks are held by the clip as described."

The third improvement is in the construction of what are called "fence rings," and consists in perforating the rings with small holes or slits, whereby the tallow, or other material of which the candle may be made, is enabled to flow round the wick. The claim is to "the mode of making fence rings with an open upper surface."

The fourth improvement is a wick-carrier for hollow candles. It consists of a metal cone, into which a short wick, or wicks are placed, and there are slits, or openings at the top of the holder, as in the fence rings. It will be evident that as the candle is consumed, the holder will slide down the hollow of the candle, the conical shape of the holder preventing the melted tallow, or other material from descending down below it. The claim is to "the mode of applying wick-holders to candles as above described."

FREDERICK BROWN, OF LUTON, IRON-FOUNDER, *for improvements in stoves or fire-places.*

One box or chamber is enclosed within another. The fuel is placed in the inner chamber, which is provided with fire-bars or a suitable grate at bottom. The atmospheric air to support combustion is "introduced from above and descends *down* amongst the fuel," while the products of combustion pass *down* between the bars, and then away by certain side passages to the chimney.

The claim is, to "the mode of placing the chamber having fire-bars, or suitable grate within another chamber, when the air for supporting combustion of the fuel in the (inner) chamber is caused to pass downwards, through and amongst the fuel, and the products of combustion pass between the fire-bars, or grating, as described."

We should have thought it would have been found a difficult matter thus to reverse the usual order of things; but we observe, that Mr. Loudon, in his lately published Supplement to his Encyclopædia of Architecture and Furniture, speaks well of this Luton stove, and Mr. Loudon is a good authority. Speaking of a range on this principle, he says, "There can be no doubt of the improvement effected in this range in the avoidance of smoke and dust, economy of fuel, &c., over the common range."

Errata in Mr. Beyse's paper.—Page 423, equation 1, should be

$$v = \left(\sqrt{\frac{K\,A}{K'\!f\!A'}} + 1\right) V.$$

Page 425, 1st line from the top should be

$$51\ K\ A\left(\sqrt{\frac{K\,A}{K'\!f\!A'}} + 1\right)V^{3};$$

Ibid. 7th line from the top, should be

$$P\,v = 51\ K\ A\left(\sqrt{\frac{K\,A}{K'\!f\!A'}} + 1\right)V^{3}$$

Ibid. 10th line from top, should be

$$+1 = \sqrt{0{\cdot}08} + 1 = 1{,}3.$$

Ibid. 20th line from the bottom, instead of "or those which have 30 to 32 horse power," read, "neither those which have 30 to 32 horse power."

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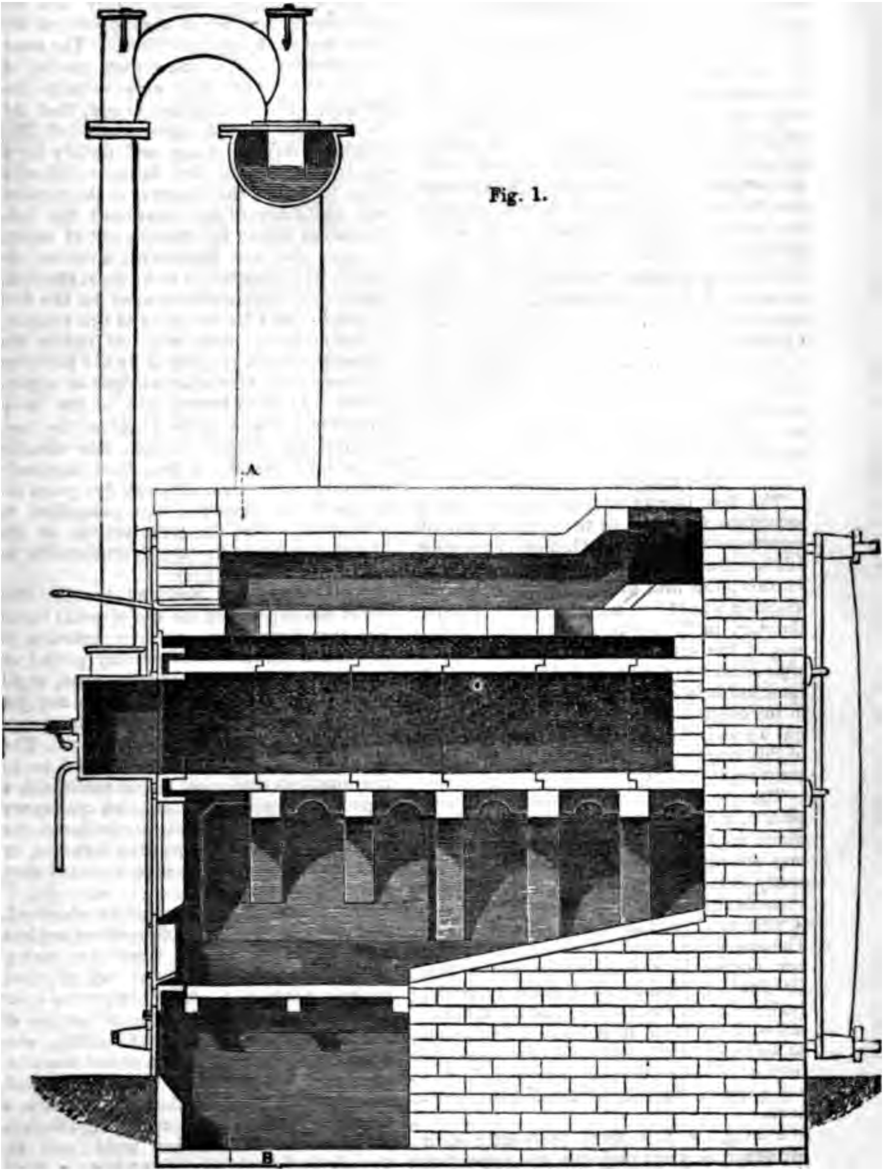
GRAFTON'S EARTHEN GAS RETORTS.



The notice taken in our recent review of "Books on Gas Lighting," of the successful substitution of earthen retorts for the more common ones of iron, has led to our being favoured with numerous enquiries for some further information respecting the mode of constructing and fitting them up. For the satisfaction therefore of the enquirers, and in the hope of promoting the more general adoption of what appears from every account to be a most useful invention, we extract from Mr. Clegg's Treatise the following additional details, as also the accompanying engravings (on a reduced scale); but we would advise parties desirous of erecting retorts on this plan, to apply for the professional aid of the inventor, Mr. J. Grafton (Gas Works, Cambridge,) or Mr. Clegg himself. Fig. 1 of the engravings is a longitudinal section of a set of these retorts, with the well-known hydraulic valve of Mr. Clegg, sen., attached; fig. 2, a transverse section through the line A. B.

Mr. Clegg's Description.

The first idea of adopting fire-clay as a substitute for metal in the construction of retorts occurred to Mr. Grafton in the year 1820, when he took out a patent for the invention; the first of them erected in this kingdom was at the manufactory of Messrs. Butcher, in Wolverhampton. This retort was of the square form, but it was soon after altered to the oven, or D-shape, which form has been adopted ever since, as shown in the engravings; large numbers have been put up under his direction in different parts of this kingdom and in several towns on the continent.

The reader will fully understand their plan of construction from the engravings, which require no description, except that I may remark, that the bottom is exposed directly to the heat of the fire, and is slightly "cambered," or curved upwards, to enable it with more certainty to retain its form. The cement with which the parts of the oven are jointed is a composition which Mr. Grafton has been at much pains to render perfect, but he has not favoured me with the materials of which it is formed. It seems to be an excellent substance, and when the interior is coated with it, becomes vitrified and quite gas-tight under considerable pressure.

During the first seven years after their introduction, great prejudice and opposition from interested bodies existed against this plan; and to such an extent did this proceed, that in one of the principal gas works of the metropolis, where six of the largest ovens of this description were set up at a great cost, a plot was almost simultaneously laid for their destruction, which soon produced the effect desired by the contrivers. The same fate attended two of the retorts erected at Montpelier, where they were wilfully destroyed. It is but justice to add, that the directors of both companies afforded Mr. Grafton every advantage and facility for a fair trial, and in the first instance, offered a large reward for the discovery of the persons who had designed and occasioned the loss. I mention this as an example out of many, to show that new inventions, however valuable, which profess to make great changes, rarely meet with encouragement in the first instance. As a further proof of this remark, I may notice the long time lost before the immense advantages offered by the meter to gas companies were acknowledged or appreciated. At Manchester, one of the most enlightened towns in the kingdom for mechanical and chemical science, this valuable instrument was for a long time expressly forbidden to be used, although five years afterwards the directors were compelled to acknowledge that the great success of the Manchester works was chiefly attributable to the meter.

In England and Scotland the fire-clay retort has superseded the use of metal in no less than forty towns; in some instances it has lasted for the extraordinary period of twelve years; while, during this time, at all other works where the invention is not yet used, it may be asserted that iron retorts have been renewed as many times. The oven, or D-shaped retorts are found to be the most advantageous, being made with a capacity to carbonize 1 cwt. of coal every hour. They can be constructed either to be heated by coke ovens, or coke furnaces, or by the burning of tar; with coke ovens they are more durable.

One practical point must be observed, that clay retorts of small dimensions are less economical than those of larger size, owing to the great per centage of fuel required to keep them at a proper temperature for decomposing the coal. The advantage of using the latter description of distilling vessel is simply a question of profit and loss; or, whether it was cheaper to *burn iron or coal.* The material of which they are formed is a non-conductor of heat, consequently, the absorption of caloric is less rapid; and although they retain their heat when a fresh charge is introduced better than iron retorts,

Fig. 2.

yet not sufficiently to bring down the quantity of fuel as low as that required for metal. Notwithstanding this, even small clay retorts are preferred in many places, particularly in Scotland. Mr. James Reid, of the Montrose Gas Works, has favoured me with the following description of the earthen retorts:—

"We have had clay retorts in operation for the last three years, and from the great difference in price compared with that of iron retorts of the same size, and from the immense superiority over metal in working them, we have entirely given up the use of the latter. I tried the retorts in the shape of an ellipsis in the D and circular form, and find the cylindrical to be the best adapted for carbonizing the coal effectually. The size I find best adapted to all purposes, is 8 feet long, 14 inches diameter, and 4 inches thick: such a retort costs at Inverkatling, or Clakmannan 2*l*. 6*s*.; the pillars, or columns for supporting them are 6*s*. each, and each retort finished costs 3*l*. 4*s*. The mouth-pieces are cast metal, and fastened to the end of the retorts by bolts and flanches, as in the ordinary description, and jointed with fire-clay and iron cement. The retorts are made in two lengths, and are jointed by a body of fire-clay well diluted with water. The most economical plan for erecting them is to set them three under one arch, heated by one fire. Their only drawback is, that when the heat is let down, they contract unevenly on cooling, and are liable to leak when again required for distillation; they generally last two years."

Clay retorts have been used some years by Mr. Eunson, of Wolverhampton, with success, the cost of material for setting an oven being under 2*l*. The retorts are circular, and made in joints of 32 inches long. In several places these retorts are made at the works.

PURIFICATION OF WATER.

Sir,—Knowing that your scientific publication is open to every subject connected with public utility, I could wish to address you concerning an invention which has of late attracted my attention. Last summer I heard much of a design proposed by an ingenious and scientific foreigner for purifying the water of the metropolis by means of filtration, on a plan of far greater magnitude than has hitherto been attempted. He has succeeded beyond all doubt in demonstrating the *reality* of his plan, and evinced by experiments, made in the presence of approved judges, the practicability and sure success of his invention. But just when every thing appeared in train for the realization of his magnificent project, the matter seems to have been laid aside. Whence does this arise? Is the obtaining of pure water a matter of such trivial importance that it can be viewed with indifference, especially too, in this water-drinking age? It has been justly said that "water is so essential both to the animal and vegetable creation, either for aliment or other purposes, that its importance probably surpasses that of every other substance amongst the great exuberance bestowed by the beneficent Author of nature. The health, comfort, and enjoyment of mankind, constantly require a plentiful supply, and therefore if utility be a just criterion of value, the inventions and operations to furnish it readily and abundantly in a *clear* and *salubrious* state, would seem to be entitled to peculiar attention." Is it the additional expense that makes the companies fear to adopt any plan which must necessarily lead to the augmentation of the water rate? If the plan suggested involved any large addition to the rate already imposed, that might furnish a plausible reason for delaying to adopt this valuable invention; but I am told that the scientific projector proposes so small an augmentation that, even in these economical days, it ought not to induce a moment's demur. Some will say that the quantity of pure water absolutely requisite in families is but small, the greater part of what is received being used for domestic purposes, as cooking, washing, &c. But would our cookery be less agreeable for being assisted by water purified from all the extraneous matter, which, owing to various causes, will inevitably become mingled with it? And where is the good housewife who would not prefer water pure and clear, for the purposes of washing, cleaning, &c., rather than the brown or yellow muddy stuff which sometimes presents itself under the name of water? Do we not hear continually such complaints as these, "The water is so bad we cannot drink it"—"The water is so muddy it is not fit for use." I think, therefore, when means are proposed by which those inconveniences might be avoided, they ought to be seriously and properly attended to, and if proved to be as excellent in practice as in theory, general utility and comfort require that they should forthwith be rendered available.

Trusting that this letter may be the means of directing attention to the subject, I am, Sir,

Your very obedient servant,

BARTLE CANHAM.

London, May 31, 1842.

[We recollect having heard some very surprising accounts of the system of filtration alluded to by Mr. Canham about a year ago, but from nothing coming of it, we were led to set it down in our minds as one of those nine days' wonders of which the arts and sciences are so notoriously prolific. If there be really any merit in the invention, and the present enquiry should happen to meet the eye of the inventor, we shall be happy to assist him in bringing it once more under the notice of the public. The purification of the water of the metropolis is still a great desideratum.—ED. *M. M.*]

POWER WITHOUT STEAM.

Sir,—Nearly all men are agreed that the power of steam will some day be superseded by a newly applied expansive force, such as condensed air can supply. The usual question has been—"by what power will you condense the atmosphere independent of human labour or steam?" and my reply was usually—"by some ingenious application of the force of gunpowder, or the materials of which it is compounded." But I was never able to indicate in what manner that force could be applied mechanically. It has long been employed for murderous purposes and overwhelming cruelty in a horizontal direction, but there appears to be no reason why its agency now should be so limited. A worthy friend of mine has, in

fact, been lately engaged with good promise of success in trying to apply its force vertically to the purpose of lifting great weights in a perpendicular direction, so that a power may be obtained from the fall of these weights to actuate machinery—an ingenious device, which I think might be employed to effect one great desideratum, the condensation of air. Here we have the rudiments of a powerful method of impelling vessels independent of steam, and quite as easily applicable. Let practical men therefore commence a series of experiments on this principle—founded on the expansive force to be obtained by the combination of sulphur and saltpetre; and I have no doubt, that these would lead to the safe and easy employment of the powers of gunpowder in condensing air, which might be ejected on machinery capable of impelling any vessel in perfect subjection to the will of the operator.

I am, Sir, your obedient servant,
G. CUMBERLAND, sen.

Bristol, May 24, 1842.

P.S. I some time ago communicated to a man of genius connected with our Mint, a plan for condensing air by means of an instrument used in coining, but that would be attended with manual labour.

DR. PAYERNE'S SUB-AQUEOUS EXPERIMENTS.

Dr. Payerne repeated on Wednesday last at the Polytechnic Institution (for the third time) his experiment of living under water without any communication with the upper air. He descended in the bell precisely at eleven o'clock, and remained there without any other supply of vital air than that which he was able to manufacture for himself (the *how* is the puzzling question) for three hours. The temperature of the Hall at the time of Dr. P.'s descent was 74° Fahr., and a thermometer which he took down with him, and examined every quarter of an hour exhibited the following changes.

Hour.	Thermometer.
11	67
¼	68
½	67
¾	66
12	65½
¼	65
½	65
¾	65
1	65
¼	65
½	65
¾	65
2	65

Dr. Payerne states that the only inconvenience he felt was a slight stunning sensation on first descending in the bell, and on emerging from it, occasioned, no doubt, by the sudden transition from one degree of temperature and pressure to another.

Patents for the invention are now in the course of being applied for, and until they are secured, it is not to be expected that any public disclosure of the means made use of by Dr. Payerne will be made.

To demonstrate in the mean while the practical value of the invention by a still severer proof than any to which it has been yet subjected, Dr. Payerne has made an offer to the Lords of the Admiralty to go down *to any depth, in any place they may select, and to remain constantly submerged for the space of twenty-four hours.* We think it probable their lordships may hesitate to be consenting parties to an experiment, so certain under any circumstances to be of a very trying description (for nature must require the repose of sleep under water as well as above,) and which, for any thing yet known to the public, may be full of danger; but we may at least confidently reckon on their affording Dr. Payerne every facility and assistance within reasonable and prudent limits, for testing the working capabilities of his system.

VOLTAIC ELECTRICITY—EXTRAORDINARY EXPERIMENTS ON THE SERPENTINE RIVER.

We had the pleasure of being present on Thursday last (the 3rd inst.) at some experiments made on the Serpentine River by Messrs. Wright and Bain, already so well known to the public for their electrical clocks, which were productive of results of a singularly novel and interesting character. An impression has generally prevailed that an electric current could not be transmitted by wires to any considerable distance, unless protected by tubing or some other covering from wet, owing to the supposed

tendency of water or moisture to interrupt or destroy the current; and so strong has this impression been, that the chief difficulty, as well with those who have busied themselves with the application of electricity to telegraphic purposes (Messrs. Cook and Wheatstone, for example, hitherto the most successful experimenters in this line,) as with those willing to avail themselves of it, has been the great expense of providing such tubing—amounting to from 250*l.* to 300*l.* per mile. Messrs. Wright and Bain having recently turned their attention to the subject of electro-telegraphic communication, began very philosophically with questioning the truth of this assumption of the non-conductible or dispersive properties of water and moisture; and have ended with proving, beyond all dispute, that it is altogether fallacious! Another remarkable instance this of the serious practical blundering into which the vicious habit of taking things for granted, is apt to betray even the most learned of men. As in the infancy of the railway system, nobody imagined that smooth wheels would ever run on smooth rails, and nobody thought of *trying* whether they would or no; so in the infancy of electro-telegraphic communication, every one has been subscribing to the absolute necessity of protecting the wires from contact with moisture, and many have been the ingenious devices and contrivances for the purpose, whereas, the first persons who try to do without any such protection, find to their agreeable surprise that nothing is less needed!

The fact, that water, in its natural state, possesses in a high degree the property of transmitting the electric current (as well as when in the acidulated state, in which it is used in voltaic batteries,) was first distinctly ascertained by some experiments made by Messrs. Wright and Bain, at the Polytechnic Institution. But desirous of proving it on a larger scale than that Institution admitted of, they applied for, and obtained permission from the Duke of Sussex, the Ranger of Hyde Park, to make the experiments on the Serpentine River, to which we before alluded, and which we shall now proceed briefly to describe.

1. An electric current was first transmitted from a small Grove's battery *across the* river from bank to bank, *through two* copper wires immersed in the water, and left quite bare and unprotected. The success of the operation was perfect.

2. A *single* wire was then laid along one bank of the river from the bridge, to near the south east end, a distance of about half a mile, with both ends dipping in the water. The rest of the galvanic circuit was supposed to be completed by the water, that is to say, it was predicated that the water, indifferent conductor as it has been hitherto considered to be, would of itself serve the purpose of the second wire—the immense bulk and extent of the body of water notwithstanding. Bold as this hypothesis was, we had the pleasure of witnessing its complete verification. The current was transmitted through the partly liquid and partly metallic circuit thus formed, with the same instantaneousness as if it had consisted entirely of metal; reversed, too, at pleasure; and this, times without number. Passing an electric current through such small jars of water as one is accustomed to see used in galvanic batteries is a comprehensible enough performance; but to transmit in an instant, the product of a tiny pocket apparatus through a jar half a mile long, a quarter of a mile broad, and containing many million millions of gallons, is, it must be confessed, a thing passing all comprehension. We can but record the fact and wonder.

3. A wire—single wire as in the last case, was finally laid with one end in the river, and the other in a well about 300 yards from it. The electric current was passed through this circuit, with the same facility and success as in the other experiments. Here there was a triune circuit formed, consisting of the wire, water, and earth.

What the limits are to this conducting power of water, or whether there are any limits at all, remains yet to be ascertained. All that Messrs. Wright and Bain seek to deduce from their experiments at present is, the important fact that the wires of electro telegraphs do not, as has been imagined, require to be insulated from damp, and that the expense of enclosing them in pipes, need therefore be no longer an obstacle to their general introduction.

VENTILATION OF MINES.

[From the First Report of the Children's Employment Commission, 1842.]

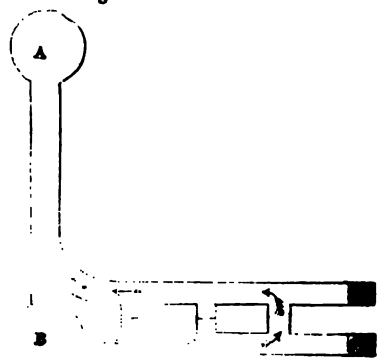
COAL MINES.

The best mode of ventilating mines hitherto discovered is that by means of two shafts sunk near each other, perhaps from 12 to 20 yards apart. A stream of air is made to descend one shaft, called the down-cast shaft, and a corresponding stream of air to ascend the other, called the up-cast shaft. The air is set in motion by means of a fire which is kindled in the up-cast shaft. A portion of the air in contact with the fire in this shaft, undergoing the ordinary chemical change which takes place in atmospheric air in the process of combustion, is decomposed: the nitrogen is separated, and the oxygen uniting with the carbon of the fuel, forms carbonic-acid gas. Both these gases, as well as the portion of atmospheric air which remains undecomposed, being heated are expanded, and occupy a proportionally larger space than the same weight of common atmospheric air, and in obedience to the laws of all fluid bodies, are borne upwards, consequently a strong current of air ascends this shaft; but if a free communication has been established below between the two shafts, an equal current must at the same time necessarily descend the second shaft to fill up the partial vacuum which has been made in the first.

Here then a power is generated capable of forcing a current of fresh air far beyond the distance to which any mine extends. The great generator of this power is the fire, and this power will act with a force and steadiness proportionate to the degree of heat steadily maintained at the bottom of the upcast shaft.

After two shafts have been sunk in a coal-field, the first operation is to establish a communication between them by digging out the coals from the one to the other. The next is to carry forward a mainway from the foot of each shaft, and then to make a road from the extremity of one mainway to the extremity of the other. If a door be now placed in the road which leads directly from the foot of the one shaft to that of the other, the air cannot then pass that way, but must go round along the one mainway across to the other, and thus to the foot of the shaft in which there is the fire, up which shaft the current must ascend.

To whatever distance we suppose the mainways, the sideways and all the other works of the mine to be carried, communications may thus be made between them, and by means of doors properly placed, the circulation of the air may be conducted and guided through them to any extent and in any direction that may be desired. A very simple diagram, showing the principle of these arrangements for ventilation, without the intricacy attaching to a plan of all the ways in an extensive pit, is subjoined from Mr. Fletcher's Report, § 20: App. Pt. II. p. 822. A is the upcast-shaft. B the downcast shaft. The arrows indicate the course of the air through the underground passages from the downcast to the upcast shaft; and the lines drawn from one pillar to another, show the trap-doors or partitions which prevent the current of air diverging to the upcast-shaft before it has swept the more distant workings.



As the fresh air that descends the downcast-shaft passes along the various roads through which it is directed, it not only affords the means of healthy respiration to the work-people, but in its course collects and carries with it every heterogeneous matter which it can hold in solution, or which is capable of being mixed with it, which it conveys out of the mine through the upcast-shaft into the air above. The various matters which are thus conveyed out of a coal-mine in this ascending current are atmospheric air, carbonic-acid gas, nitrogen gas, carbureted-hydrogen gas, moisture, and animal effluvia.

In looking at the plans of large coal-pits there seems to be great perplexity and much ingenuity in the manner in which the air is conducted to the different parts of the mine, but the great principle in all is the very simple one which has now been stated, and at the cost of maintaining a sufficient fire at the foot of the upcast-shaft, and an adequate arrangement for conducting the current of air through the pit, any coal-mine can be perfectly ventilated.

Several of the sub-commissioners have given detailed descriptions of the different modes of ventilation adopted in their respective districts.

From the evidence it appears that in all the districts there are particular mines in

which, often at great expense to the owners, every precaution is taken which intelligence and skill can devise to render the mine healthy and safe; but that there are great numbers of mines in which both ventilation and drainage are grossly neglected, and in which, as a necessary consequence, there is often a frightful destruction of human life.

COPPER, TIN, LEAD AND ZINK MINES.

(Cornish District.)—In proportion as a mine increases in depth, the importance of ventilation increases, and it becomes at the same time more difficult to effect it thoroughly. As far down as the adit level there is usually a free perflation, and it is only in an 'end,' a cul-de-sac remote from the shaft, that the air can be materially impure. Farther down, as no horizontal communication with the surface can exist, the interchange of ascending and descending currents of air affords the only natural supply; and by making the levels of large size, and establishing free communication between them by the short levels, called winzes, aëration (considered sufficient) is effected even in the deepest mine in Cornwall, without the use of air machines. In fact, those which have been hitherto commonly adopted are much more advantageously applied in the shallower mines or parts of mines. (Dr. Barham's Report, § 30, 31: p. 738). To ventilate ends not relieved by winzes, resort is had to air cylinders, a current being forced through wooden pipes, and to falls of water from one level to another.

An analysis of eighteen samples of the air from different places in which the men are employed, shows an average composition of oxygen 17·067, carbonic acid 0·85, and nitrogen 82·848. The Sub-Commissioner states, "that in one instance the quantity of oxygen was reduced to 14·51, and in another the quantity of carbonic acid was raised to 0·23. These results exhibit a lessening in the proportion of the vital ingredient of the air from its usual per centage 21, and an increase in a directly noxious ingredient, carbonic acid gas, from 0·05, its ordinary amount, calculated to produce effects sufficiently injurious to those who, for hours together, inhale such a fluid. But the proportion of deleterious gases occasionally present where the miner must labour (whether of sulphuretted hydrogen and sulphurous acid, which are very rapidly absorbed by the water lying in the levels, or of carbonic acid, which accumulates, like water, where there is no drainage), is much greater than that detected in the analyses here reported. It is then that the distinctly poisonous effects of these agents are produced, and loss of life, either at once or more remotely, has often been the consequence. Carbonaceous particles from the candles and from blasting, and mineral-dust from the working of the strata or veins, are also suspended in the air which the miner inspires, and give a peculiar character to his expectoration: copper has even been detected by analysis in notable quantity in such air (Ibid. § 30: p. 738).

No method hitherto introduced is adequate to maintaining the air in the places in which the miners work in anything like a state of purity; and even in those parts in which ventilation keeps up a fair supply of fresh air, there is in almost all mines a constant smoke after the first blasting in the morning; so that the shafts and galleries are not unlike chimneys, often sending out a visible column at the surface. The smoke is sometimes so thick (Evidence, No. 1: App. Pt. 1., p. 822, l. 3) that the miner can with difficulty see his hand.

From the nature of the case, the most advanced point of the excavation must be a cul-de-sac, and it will often be impossible to establish any communication with parts above or below. Hence it is that almost every miner in the deeper mines is at times exposed to what he himself designates "poor air," by which he means air so impure as to affect him in a noxious way distinctly perceived by him at the time. Of the less marked degrees of impurity he makes no account. Of the deficiency of oxygen, the excess of carbonic acid, the presence of sulphurous acid or sulphuretted hydrogen, he is not aware, and of smoke, however dense, he seldom takes any notice. (Ibid. § 32, 33: pp. 738, 739).

(Alston Moor District.)—At his place of work, however remote, says the Sub-Commissioner for this district, the under-ground labourer has no air except what comes from the level by which he has entered. There is nothing to make a current. Yet some levels in this district are half a mile in length, some a mile, and one called the First Force Level is nearly five miles in length. In such a situation "only slowly, and very slowly, can the air about him, merely by the effect of a difference of temperature wind its way upwards, and make room for other air which may penetrate to take its place."

Means may be taken to diminish an evil which cannot be removed. Sometimes a body of air may be forced in by a fall of a stream of water from the top surface of the hill. An opening is made for it to descend down to the level, which it does with great violence, driving a body of air before it, and then it runs out along the bottom of the level from the mine.

Machines, or fanners, are also used, being

by boys, and the air is carried along places to which it would otherwise ry slowly penetrate. Forcing-pumps employed to force forward the air in r way. Sometimes a supply of fresh y be got by running a second level e air into the hill, and making a communication. In that case the air may be ıction, and may enter at one level and by the other. Sometimes a shaft carried up to the open air, or let om the open air into the level; and hat is done a current of air may be . Whatever is within the range of rrent, of course, is well ventilated.

. things, however, are not the general In most mines there are not two lemmunicating with the open air, neither re be shafts from the open air down levels. Where nature does not in- a physical impossibility, there is s equally powerful—the dread of ex- The sum required to sink a shaft run a level may be so great that the not worth it. The proprietor would discontinue working it than submit burthen; and the men, young per- nd boys, having no other means of ce, are eager to be allowed to work at ne such as it is. (Dr. Mitchell, Re- 51, 56: App. Pt. II., pp. 727,728).

'EMPERATURE OF MINES.

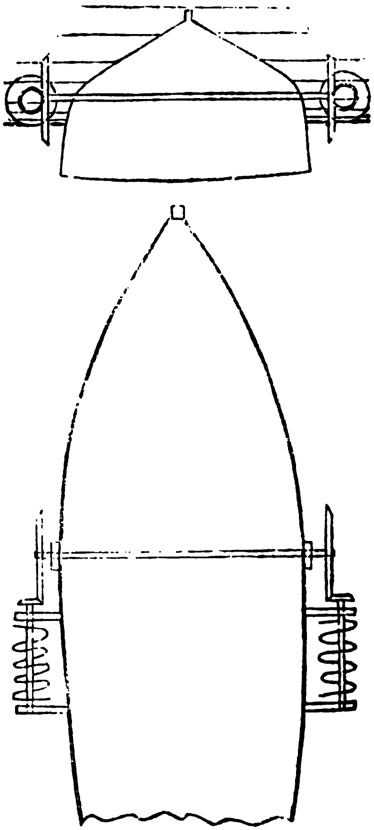
(From the same Report.)

l pits are almost always comfortably ; and in general the deeper they are, rmer. By proper ventilation the heat nerally be so regulated as to render mperature unoppressive, and even il. When cold in the main roads the often oppressive in the side gates and s workings. Oppressive heat may be regarded as an indication of im- : ventilation. It is stated that in the of the Yorkshire coal fields the ther- ter stands in the main roads at from 60°, in the side roads from 60° to 65°, t the workings from 64° to 72°. In ep mines in the northern coal field the rature is considerably higher. In one Hetton pits, in South Durham, the rature was found to be 66° at the bot- f the shaft, and 70° in the workings; ı the Monkwearmouth colliery, the t in the northern coal field the aver- mperature ranges from 78° to 80°, and ıe parts of this mine it occasionally o 89°.

COPPER, LEAD AND ZINC MINES.

rnish District.)—The natural tempe- of the mines in the south western dis- ncreases so rapidly, that at the depth) fathoms from the surface it varies from 81·2 degrees to 85·6 degrees Fahrenheit. When the work is in progress, there is, of course, a rapid exchange of oxygen for carbonic acid, by means of the respiration of the miners, and the burning of the candles; and when the blasting takes place, the gases generated by the explosion of gunpowder are diffused, and a thick smoke fills the shaft.

IMPROVED APPLICATION OF THE SCREW TO STEAM NAVIGATION.



Sir,—I make free herewith to send you some sketches of an application of the screw to steam-vessels, which I have already submitted to my friend, Mr. John Seaward, and to others, but on which I should like to have the opinion of some of your intelligent correspondents. The sketches speak for themselves,

and possibly exhibit nothing new. The shaft placed sufficiently low is meant to move two screws placed longitudinally beneath the water line in midships. Sponsings or other contrivances would protect them, when in rivers or port, from outward injury. The screw thus applied, one would think, must prove more efficient, than at the stern of the vessel, where, besides other difficulties, a considerable vacuum has been found to deprive it of much of its power.

I am, Sir, your obedient servant,

FREDERICK SCHERR.

Kew Green, May 6, 1842.

OPTICAL PHENOMENA.

Sir,—Perhaps some of your scientific readers will explain the following phenomena which I have observed.

1. When a piece of sheet zink is slightly wetted with dilute nitric acid and the finger drawn over the plate a most beautiful transparent blue colour presents itself, similar to the fine variety of Prussian blue? I have always observed the same phenomenon under the same circumstances.—2. How is it that a reflected image of a candle flame is seen on the carbonaceous film deposit on smoked glass, or any other object, when viewed at particular angles?

I am, &c.

K. DALTON.

Newark.

BLASTING ROCK—SAND TAMPING—GALVANIC BATTERY.

Sir,—In a description of Roberts's galvanic apparatus for blasting rock, in No. 978 of your Magazine, I find an important error promulgated with a tone of authority that may lead to a continued perseverance in a very injudicious practice; I allude to the arguments in favour of tamping with *dry sand.*

It is stated that Mr. Roberts "believes that *many hundred weight* of gunpowder would be required to blow out a column of sand 2 inches in diameter, and 18 or 20 in. in depth, placed in a solid rock."

Now I will venture to assert, that *one ounce* of gunpowder under such circumstances would blow out every particle of the sand. The experiment may be easily tried by any one. This mistake has long been current, and arises from assuming, as *fact*, a principle that has been deduced from *inference*. The enormous resistance to the *pressure* of a volume of *sand* through a cylinder or tube is well known; owing to the particles by *pressure* becoming thoroughly wedged against the sides of the tube; but the effect of the explosion of the powder is to *penetrate* through all the interstices, and to *separate* the particles instead of wedging them together.

With respect to firing charges by a galvanic apparatus, it may be applicable to very *great* explosions, but the delicacy of the arrangements, and their want of simplicity for use by common workmen, as well as the expense of its application, including that of the portion that must be destroyed at each blast, would preclude its employment under any ordinary circumstances; its adoption is the less necessary, since so much facility is given to firing charges either under water or otherwise, and such perfect security from accidents obtained by the invention of Bickford's Safety Fuse, an article that cannot be too strongly recommended.

I am, Sir, your obedient servant,

J. F. B.

THE ROLLER SUBSTITUTE FOR WHEELS.

Sir,—It may be worthy of notice as a matter of historical curiosity that there was a patent granted as far back as the 3d of William and Mary (1691), to a person of the name of Kendrick Edisbury, for an invention, having precisely the same object in view as that of your correspondent, Mr. George Robinson (p. 386 present vol.). As the practice of requiring enrolment of specifications had not at the date of that patent come into use, it is impossible to say whether Edisbury's invention resembled Mr. Robinson's in its details, but the following extract from the patent itself will show that the result was the same.

"Whereas, Kendrick Edisbury hath by his humble petition represented unto us, that with great danger, and much time spent, he hath invented and found out a new art or invention *of certain rollers to be used under the bodies of carriages, carts and waggons instead of wheels*, which will be far more useful than wheels, by amending and preserving, as well the highways as private grounds, which said invention was never used in England before, and prayed us to grant him our Letters Patent for the sole use thereof for the term of fourteen years; know ye therefore, that we, being willing to cherish and encourage all laudable endeavours and designs of such our subjects, as have by their industry found out useful and profit-

able arts, mysteries and inventions, and that the said Kendrick Edisbury may accordingly reap some fruit and benefit of his labour and charges in and concerning the premises of our especial grace, certain knowledge and mere motion have given and granted by these presents," &c.

It appears further, from Mr. Webster's Patent Cases,* that Edisbury's patent was afterwards the subject of an action for an infringement, when a verdict was given in his favour.

I am, Sir, your obedient servant,

WARDER.

MR. WALKER'S WATER ELEVATOR—CHALLENGE TO THE CENTRIFUGALISTS.

Sir,—In your Number 981, "W. P." states, that with a proportionate power his centrifugal pump will do five times the work of Mr. Walker's machine for raising water. I wish to know whether I rightly understand him to mean that, with the same power applied to each, in the same time, the centrifugal pump will raise five times as much water? I find that Mr. Walker's machine raises one-third more water than my old one with the same power in the same space of time. In fairness, therefore, to all parties, I should like to see this centrifugal pump in action. I do not know how it acts, but if "W. P." will show me that he can at the same expense, or first outlay, affix an apparatus to raise fluids, say 30 feet, in the same space of time (say one hour,) with the same power (say one man), and raise as much as one-tenth more than I do with Mr. Walker's apparatus, then "W. P." may hear of something to his advantage. On his acquainting me (by a note addressed to your care,) when he will be prepared to exhibit his centrifugal pump in action, I shall immediately adopt means to test the comparative efficiency of the two instruments—not by a private, but a public trial in the presence of scientific persons—the results of which, whatever they may be, shall also be made known to all the world.

I am, yours, &c.

T. Y.

June 3, 1842.

P.S. I have sent a copy of this to Mr. Walker, who will give my address—and who is quite agreeable to my proposal.

* A new work in course of publication, by the learned author of the "Law and Practice of Patents," the best book on the subject which has yet appeared.—ED. M. M.

WALKER'S WATER ELEVATOR.

Sir,—I should have answered the letter of "W. P." sooner, but I was waiting the arrival of one of my large machines from Messrs. Ransome's manufactory, which I have now received, and which any of your readers may see if they feel inclined. It is not so outrageous in weight as "W. P." would have us to believe. It is calculated for one or four men, and weighs only 1 cwt. 2 qrs., and will deliver 50 or 200 gallons per minute, according to the size of the tube. "W. P." has so miscalculated and misrepresented an invention that he knows nothing of, that were I to write for one whole year in your Magazine, to prove that it is superior to his friend "Centrifugal," we should, without a fair practical trial, be just where we began, and your readers no better informed. I therefore call upon "W. P." to come forward in an honest straightforward manner, and substantiate the challenge which he has made in the *Mechanics' Magazine*, May 28.

"W. P." may have the choice of height from 10 feet to 50, and the trial to come off within a month, before practical men, for no less a sum than 100*l*. Perhaps, Mr. Editor, you will favour us with your presence, as the trial must be on the banks of the Thames for the convenience of scientific men residing in London.

When all this has been done, then Mr. "W. P." may reason with certainty, and your readers be in a position to judge for themselves.

I remain, Sir, your most obedient,

J. WALKER.

King William-street, City, June 8, 1842.

[We shall willingly be present at the proposed trial; but we should like to see the money part of the wager abandoned. The triumph of truth ought to be triumph enough to either party.—ED. M. M.]

THE "SWIFTSURE" STEAMER AND BLAXLAND'S PROPELLER.

Sir,—The tremor you remarked when on board the *Swiftsure*, immediately above the propeller, is wholly removed when the vessel is properly trimmed. The motion, however, is so slight, and at the same time, in so unobjectionable a place, that I feel scarcely justified in troubling you with these few lines respecting it.

I am, Sir, yours faithfully,

F. COLLIER CHRISTY.

Hatcham Manor House, June 4, 1842.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

OGLETHORPE WAKELIN BARRATT, OF BIRMINGHAM, METAL GILDER, *for certain improvements in the precipitation or deposition of metals.* Enrolment Office, March 8, 1842.

Mr. Barratt claims—

First, a "mode of cleaning copper and its alloys by means of a galvanic or other battery, and also recovering by precipitation the metal dissolved during the process." The article to be cleaned is suspended from a wire connected with the negative metal of the battery, and a plate of copper of a larger superficial area than the article is suspended from the other wire, which plate receives the metal deposited from the solution. "In from five to ten minutes the scale or oxide of copper will be removed."

Secondly, a mode of precipitating zink upon other metals, by passing an electric current through a cold solution of zink in sulphuric acid. "Other acid and saline solutions of zink may be employed, as those in muriatic and acetic acids, and the muriate of ammonia, or the sulphate of zink of commerce, in connexion with the battery; but I have found the former (the sulphuric acid solution) succeed perfectly."

Third, the following improvements in the precipitating of copper upon iron and other metals. 1. He connects the article to be coated by a copper wire to a plate of zink, and immerses them in a saturated solution of sulphate of copper—taking care first to wrap the zink in cloth or strong paper, to prevent any deposition of copper on the zink plate. "I have been able by this arrangement to produce a more perfect contact of the metals, particularly where iron is desired to be coated, than by any of the modes heretofore recommended or described when using acid solutions of copper." 2. He precipitates the copper from solutions of copper in the cyanides and carbonates of potash and soda. These solutions may be used at different temperatures, but the action is most rapid when boiling. And, 3. When he wishes to convert the copper coating into brass, he deposits zink upon the copper surface first obtained, (by the process described under the second head of his improvements,) and then subjects the article to a heat of about 300° Fahr. in a muffle or other convenient apparatus.

Fourth, the precipitation of platinum and palladium from their solutions, and depositing them as coatings on other metals, either by immersing a plate of zink or some other positive metal in the solutions—"taking the precaution to have free acid present," or by dissolving the platinum or palladium in muriate of soda, (twelve parts by weight,) alum, (two parts,) and cream of tartar, (one part.) "Copper, iron, and other metallic articles introduced into the (latter) solution when boiling, are speedily coated; if a stronger coating be required, I attach the battery, and an anode of metallic platinum, and continue the action till the desired thickness be obtained."

Fifth, the precipitation of gold, silver, or platinum, upon other metals, by employing boiling solutions of these metals in hydrate of potash, with or without the aid of the galvanic battery.

And Sixth, the precipitation of metals in a state of *alloy*, "by obtaining them in solution, and using an anode of an alloyed metal in the same proportion as in solution."

Mr. Barratt also describes, but does *not claim*, the following mode of "precipitating copper from waters of copper mines, and other waters containing copper." "I form pits (similar to those commonly used, but deeper) to hold the solution of white copper, or other metal. I place in the solution a porous vessel of earthenware, or divide the pit by any convenient porous material; into the porous vessel, or the (parts of the) pit partitioned off by the porous material, I put a solution of muriate of soda, and into the solution I place the iron, and connect it with wires with sheets of copper, lead, or other metal in the solution of copper, and which are to receive the deposit of pure metal. The solution, after all the copper is precipitated, will serve to dissolve the iron in the porous cell, instead of the muriate of soda."

EDWARD FRANCOIS JOSEPH DUCLOS, OF CLYNE WOOD METALLURGICAL WORKS, SWANSEA, *for improvements in the manufacture of copper.*—Enrolment Office, May 11, 1842.

The first improvement specified consists in calcining all sulphurous ores of copper, technically called sulphurets, and other artificial products of the same nature in large kilns, whereby a large portion of the coal and labour required in the ordinary treatment are economized; and the sulphurous acid gas and sulphuric acid formed in the operation, irretrievably lost in the ordinary method, are made applicable to the manufacture of sulphur or sulphuric acid.

Secondly. When the ores have been sufficiently calcined to treat them for the reduction of any metallic oxides they may contain, in a blast furnace similar to those used in the manufacture of iron, with the addition of chambers of condensation and feeding apparatus,—such additions being

d to insure the collecting of any products which the ores treated may —the earthy matters associated with are fluxed by a proper addition of other substances, according as the composition of the ores to be treated ıire.

y. The mixture of metallic copper iron thus obtained by the preceding ı, is then submitted to fusion and on in a common iron-founder's cu- dified to insure the liquidation of metals.

hly. The black copper from which iron has been separated by differ- gravity is submitted to refining in l way, in the refiner attached to the of liquidation.

Description of the Treatment.

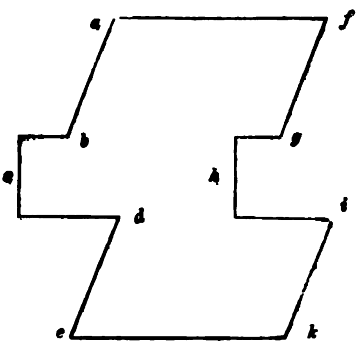
res of copper, when ground to the ne-fourth, or one-third of an inch d with quick lime in the proportion and a half cwts. of quick lime, or uts to every ton of copper ore. The me is slacked thin and mixed with in the same manner and of the like ace as common mortar. It is then heated floors between two and l a half inches thick, and cut, as spread, in parallelograms of the e as common bricks are generally The floors are then kept hot for four hours, when it will be found that ture has acquired sufficient solidity ve the rough bricks so produced to ı, where the calcination is to be The doors through which the ave been piled being closed and luted, kindled on the grate of the kiln fur- til the mass becomes of a dark red e ash-pit door, to which air-slides are closed hermetically, as well as the r, and the admission of the fresh air ontrolled to keep the mass of ore burn- he same temperature, which is also fected by the regulation of the draught aping products of the combustion, by of dampers placed on the eduction It is found in practice when the first ion is over, that it is advantageous another fire at a rather increased ture, and thus more completely ob- expulsion of the sulphur contained ore by the repetition of the above d treatment. The ores of copper, in mps not exceeding 2 inches square, calcined in prismatic kilns with grates, with the same arrangement of described as is necessary for the re- of the draught, and when sufficiently , may be taken at once to the blast The ore thus calcined is charged with a sufficient quantity of coal, or coke, or charcoal, in such proportion as the calorific power of the fuel and refractability of the ores will best allow, which is best ascertained by practice; and such a proper quantity of lime, or other flux is also to be added as the chemical composition of the ore will require. The charge is put into the furnace, in such a manner as to avoid the escape of any volatile product, other than through the chamber of condensation. The working of the furnace is the same as that followed in the working of iron ore, taking care to work with a highly-heated blast, and with closed breast, the object being to obtain a slag highly charged with lime, by which means the induction of the metallic oxides is more completely insured, and their carburation, as far as iron is concerned, more certainly obtained. The mixture of cast iron and copper thus obtained is tapped out like common cast-iron, in the most advantageous shape for the refusion, and the operation is thus conducted with great economy of labour and combustible matter without any interruption. The pigs of mixed metals thus obtained are melted in a cupola: and the melted metals are, by a disposition which keeps them at a high state of temperature, allowed to separate by difference of gravity, the copper precipitating under the cast-iron, this containing one-half or one quarter per cent. of copper, and the copper from 20 to 25 per cent. of iron, which is allowed to run out of the cupola in an air furnace, which is kept at a high temperature. Finally, to allow more complete separation of the metallic copper from cast-iron, the proportion of that metal left mixed with the copper is further separated, by means of the usual mode, followed in the reforging of black copper in the furnace when it has been tapped out of the cupola.

The claim is to "the mode of calcining the ores and fusing them in a blast furnace as before described, and also to the mode of separating the metals obtained in the treatment of the blast furnace by liquidation as before described."

William Henry Mortimer, of Frith Street, Soho, Middlesex, Gentleman, *for improvements in covering ways and surfaces, and in constructing arches.*—Enrolment Office, May 16, 1842.

These improvements consist in a new mode of combining certain substances in the blocks used for covering or paving ways and surfaces, and for constructing arches, whereby each block having its two opposite sides reversed in their cut will go together and give support to each other.

The following figure represents a block constructed on the plan of the patentee.



The patentee does not confine himself to making the inclined surfaces according to the precise angles shown.

The claim is to the mode of constructing blocks for covering roads and ways by combining the inclined surfaces *a b* and *d e* with the tongue *c*, and forming on the opposite sides of the blocks the corresponding inclined surfaces and grooves, *f g i k* and *h*.

Richard Gurney, of Trewinyon House, Cornwall, Esquire *for a new method of cutting wood, and incrusting the same, in order to present a sure footing for horses, and other purposes.*—Enrolment Office, May 25, 1842.

This new method consists in producing surfaces for the paving of roads by means of wood and other materials, which, says the patentee, "will be found more lasting, present a sure footing for horses, and prevent water passing through the crevices of such wood." A beam is sawed at its extreme length at right angles, and squared on all four sides; it is then laid down with one edge upwards, and sawed edgeways, the saw being held in an oblique direction, so that it deviates from the right angle downwards and sideways. The block thus produced is to have all its sides equal. In paving, each block is to be so placed as to lean equally on two other blocks, whilst two more blocks lean upon it. The blocks being so laid down as to present the appearance of a diamond lengthways, that is, with the two sides which incline so as to lean on two other blocks away from the spectator, and the two sides which support two other blocks next to him, it will be found that all the weight of the block is thrown forward on the farther point, the two sides of which rest on two other blocks. Mr. Gurney says, "I consider that this cut is perfect in itself, and may be used with or without incrustation."

The block thus cut is to be incrusted with, or cemented to the next block by a composition of asphalte, bitumen, black-lead, gas-tar, and other adhesive materials. In general the composition need only be applied to the sides and bottom. When it is deemed requisite to incrust the top, or upper surface, the following process must be followed. The wood is first to be steamed to render it soft and porous, and a mixture of asphalte and bitumen with gravel strewn on it is then to be beaten into the wood by rollers or mallets.

The claim is to the form of wood blocks above set forth, for paving purposes, and to the mode of incrustation, as also to the right of employing blocks of wood of the above form combined with incrustation, as before explained, for wood pavements.

Robert Wilson, of Sowerby-bridge, Halifax, Currier and Tanner, *for improvements in the manufacture of leather.*—Enrolment Office, June 2, 1842.

These improvements consist, *Firstly*, in preparing hides or skins, or parts of hides and skins, for covering rollers used in the manufacture of yarns and threads at a cheaper cost and more expeditiously than the leather heretofore applied to such purpose. After the hides and skins have passed the well-known process of immersion and working in a lixivium of pigeon's dung, they are passed through a solution of terra japonica and quercitron bark, in which solution they are allowed to remain four days, and frequently handled; the solution is also to be stirred during that period; after which they are in a fit state to be taken from the solution, and being dried, polished, and cut, can be applied to whatever purpose they may be required. *Secondly*, In a mode of splitting hides or skins, after which either or both of the parts so divided may be prepared according to the above mode, or manufactured into leather in any other known manner. After the hide has passed through the usual processes up to the immersion in bark liquor, and after having been immersed in bark liquor for four days, and frequently handled during that period, it is to be taken out of the liquor, and one end fastened to a cylinder, which is caused to revolve so as to bring that part to which the hide is attached immediately opposite to a fixed bar; the other or loose end of the hide is then passed and drawn over such bar, until a sufficient part of the hide has been so drawn over as to make that part remaining between the cylinder and the bar quite tight. Two rollers are then placed upon the surface of the hide, upon the fixed bar, so as to keep the hide upon the bar, and between it and the cylinder straight and tight as it is drawn over the bar. A knife is then screwed up to as near

rface of the bar as may be necessary to the hide into two parts, according to ickness required of each part. The er is then made to revolve so as to the hide downwards over the bar, the knife having an eccentric motion to it, cuts or splits the hides into arts throughout the entire length.

im (*verbatim*)—"But I do hereby lay im to any part of the machine, or any f the process or mode secondly above bed, except and I do hereby confine my of invention of the above described mode secondly above described to O.G. and the splitting hides in an untanned en state, as well as tanned leather."

The patentee means, we presume, the *ogee* bar, which the hide is passed to tighten it for the cation of the knife.

E REPORT—LORD ASHLEY'S BILL.

are delighted to find that Lord Ash- is brought in a bill for the entire abo- of female and infant labour in our , as also for the abolition of appren- ip to the art of mining; and that the as met with the unanimous approbation House of Commons. Of its speedily ng into a law there can be little doubt. rd Ashley's Bill proposes to enact, in st place, that the employment of women y of these works shall be at once and y prohibited; and next, that no male shall be so employed under thirteen years e. Nothing short of actual prohibition l, in the opinion of his Lordship, avail; mend matters by regulation would be impossible; the miner, when the la- ers are once consigned to him under- d, is absolute, and as to subterranean ction, it would be at the hazard of the ctor's very life. The Bill next provides e abolition of the present system of ap- icing the boys, who are kept till twenty- n a state of slavery. His Lordship con- ed that there was no pretence for any ng, for the business had nothing in it h could not be learned in ten or twelve . He instanced some cases of cruelty ely equalled in the records of African sla- , and attended with this aggravation, that young sufferers in the mine had none to e sympathy they could appeal. It was he cases of women and children only he had applied himself with a view to lative remedy; he had never attempted egislate as between the masters and the , but he besought his countrymen in the t of Christianity, to make some expia- for their sins by taking thought for the .

NOTES AND NOTICES.

The Atmospheric Railway is expected to form a prominent subject of attention at the approaching meeting of the British Association. Mr. Vignoles, C. E., the Professor of Engineering at the University College, whose enlightened advocacy of this system, in the face of much prejudice and hostility, does him infinite credit, has announced a paper on the subject, to be illustrated by models and working drawings on a large scale. It is mainly owing to the exertions of this gentleman, next to those of Mr. James Prior, the public-spirited Treasurer of the Dublin and Kingstown Railway, that it has been resolved to make the trial of this system on the branch line from Dublin to Dalkey, noticed in a subsequent extract from the *Dublin Mercantile Advertiser*. We are glad to learn that Mr. Brunel has also become a convert to its merits, so far, at least, as to recommend it during his recent professional tour in the South of Europe, as the only practicable method of establishing a railway communication from Genoa, through the passes of the Appenines. The Prussian Government have had it under their consideration to give it a trial in a part of its Rhenish provinces, where the actual character of the country opposes similar obstacles to the laying down of railways on the ordinary plan, and have consulted Mr. Vignoles on the subject; but their determination on the subject has not as yet, been made known. At some experiments made last week at Wormwood Scrubbs, where, as our readers are aware, about half a mile of railway on the atmospheric plan has been for some time laid down, a speed was obtained with a vacuum varying from 24 to 25 inches of mercury, or upwards of 40 miles an hour, and this, notwithsanding the rails are in most wretched condition, and the atmospheric appliances not much better.

Hot Times at Hand.—Luke Howard, Esq., F.R.S., who has carried on careful metereological observations for about forty years, has published the result of his observations through two complete cycles of eighteen years each. The result shows a very great general resemblance between the two periods. Mr. Howard is convinced that in each cycle there is a succession of years above the average degree of warmth, and a succession of years below the average. It is very agreeable to find that we have now just arrived at the close of one of the colder periods, and are entering one of the warmer. Mr. Howard anticipates that this, and several successive years will be genial, warm, and generally favourable to abundance of the products of the soil. The reader is aware that in eighteen years the moon, the sun, and the earth come into the same relative position towards each other as they were at the beginning of the period. Now Mr. Howard's theory is that the temperature, moisture, winds, &c., on our globe, are materially affected by the relative positions of the sun and moon towards her.

Axles Useless. — Some of the English railway companies, to justify themselves for persisting in the use of four-wheeled engines, have been proving most satisfactorily by a number of experiments with axles cut intentionally in two, that an axle thus divided is just as good for all practical purposes as one perfectly entire. The next step, of course, will be to dispense with them altogether.

Comfortable News for Railway Travellers.—A correspondent of the *Times* mentions that Dr. Buckland, the eminent geologist, stated "at his last lecture" (a mistake—it was at a meeting of the Institution of Civil Engineers the Doctor made the statement) that he "considers the Box-tunnel, as well as several others, to be in a very dangerous state, and that if they were not masonried throughout, he would stake his reputation that at some period not far distant, a serious fall of earth and rock will take place, the disastrous consequences of which no man can venture to enumerate." The Doctor laid it down as a general rule, without exception, that every tunnel which is not made through solid rock, is unsafe, unless defended by strong brick or stone-work, with provision besides for good drainage—a category which may be said to comprehend nine out of ten of all the railway tunnels in England.

Immense Stone.—The largest stone which we believe has ever been cut out from any of the fine freestone quarries which abound in our vicinity, has been this week removed from the Duke of Buccleuch's quarry at Granton. It is a block of thirty tons weight of liver-rock, and is intended to form the statue of Lord Nelson, about to be erected in Trafalgar-square, London. It was yesterday removed from the quarry to Granton Pier, to be shipped in a vessel sent down specially by the Admiralty, for the purpose of conveying it to London. The labour of removing it from the quarry was great in proportion to the ponderous mass; but under the superintendence of skilful engineers was satisfactorily accomplished. The cost of the block, with the expense of placing it in Trafalgar-square, we have been told, will exceed 300*l*.—*Caledonian Mercury.*

Cast and Wrought-Iron Rails.—A correspondent of the Mining Journal states, that at the last annual meeting of the St. Etienne and Loire Railway Company, the directors expressed their conviction of the necessity of abolishing the use of cast-iron for rails in future, and substituting wrought-iron for that purpose, as also for the spokes of the wheels; the cause of that determination was explained by the announcement that no less than 203 wheels had been broken, during the last year, from the use of cast-iron on their line, while on the Roanne Railway, where wrought-iron only was employed, but three wheels were injured.

The Taliesin Steamer and Engines. — About Christmas last we announced the launch of the *Taliesin* from the building yard of Messrs. Eyton Brothers, at Mostyn Foundry, at the mouth of the Dee in Flintshire. This vessel is intended to ply on the Liverpool and Mostyn station, in lieu of the present steamer the *Black Diamond.* Messrs. Eyton have constructed two new engines of their own invention for the *Taliesin*, on an entirely new principle, combining lightness, with power, and economy of space, and which, for distinction, may be called the "Taliesin Engines. Various trials of these engines have been made, and they are found to work admirably, with a very moderate consumption of fuel. The power of the engines is equal to ninety horses. They weigh only 15 tons, and occupy about 4 feet of the vessel's hold, while the speed of the boat, constructed rather wide with a view to towing and carrying cargo, and short so as to turn in a confined space to suit the particular station, averages full ten miles an hour, when there are upwards of two hundred persons on board. A much higher rate of speed will most likely be effected when the stiffness of the machinery wears off by use. With a vessel modelled for speed there is little doubt that sixteen or seventeen miles an hour would be accomplished. We understand that the performance of these engines is looked to with considerable interest by parties connected with steam navigation. Great praise is due to Messrs. Eyton for their spirit in carrying into effect a hazardous experiment at their own risk, and it is highly gratifying to find that the result has answered their most sanguine expectations. We understand that the Messrs. Eyton yet contemplate much greater improvement in the construction of marine engines, and we may say that most of the improvements in this most important branch of our national marine have arisen from individual enterprise and skill—the result of private competition.—*Chester Chronicle.*

Atmospheric Railway in Ireland.—The *Dublin Mercantile Advertiser* says—"Every arrangement has been completed with the government and the board of works, preliminary to the commencement of the line between Kingstown and Dalkey, on the atmospheric system. In the course of the ensuing month the works will be in full operation; and thus the Dublin and Kingstown Railway Company will have given the initiative in the practical adoption of a system which is calculated to produce such transcendently important results upon railway communication." The money for the purpose (25,000*l*.) is to be advanced on loan to the company by Government.

The largest apartment in the world, is the riding-school at Moscow, which is 500 feet 10 inches long and 138 broad, without pillar or intervening prop of any kind. The famous town-hall of Padua, which used to be considered the largest, is only 240 feet long and 80 feet broad. Westminster-hall has often been stated to be the largest, whereas it is only 275 feet by 75 feet; and King's College, Cambridge, 291 feet by 45½ feet, and 79 high.

Adams's Bow Springs.—From a statement given in the *Railway Times*, it appears that since September, 1838, no less than 204 pairs of these springs have been applied to private carriages; 322 to railway carriages, and 30 to carts, wagons and drays, in addition to 73 sets of double buffer springs, and 50 of single buffers, on the same principle, supplied to different railways. Of 72 carriages at the South Eastern Railway, 25 are on Mr. Adams's plan. A full description of the bow spring system is given in vol. xxxi. p. 113.

Rearing Timber.—No populous and industrious people can afford to grow useful timber for their own use. A fine oak will require 200 years to come to maturity. The oaks planted during the Commonwealth are only now fit to cut for decent navy timber. The land fit to grow an oak, would in the same time yield 200 green and grass crops, and in the hands of a market gardener, from 300 to 400. The fee simple of an acre of land fit to grow oaks might be bought nearly seven times over while the oaks are growing.

Tribute to the Art of Printing.—The Emperor of Germany allowed printers to wear coat armour in acknowledgment of the importance of the discovery. Printing was anciently practised by many who were of noble family as well as by eminent ecclesiastics.

Wood Paving.—It has been at length determined to pave Oxford-street with wood, and the Vestry are now *laying their heads together* to furnish the material.—*Punch.*

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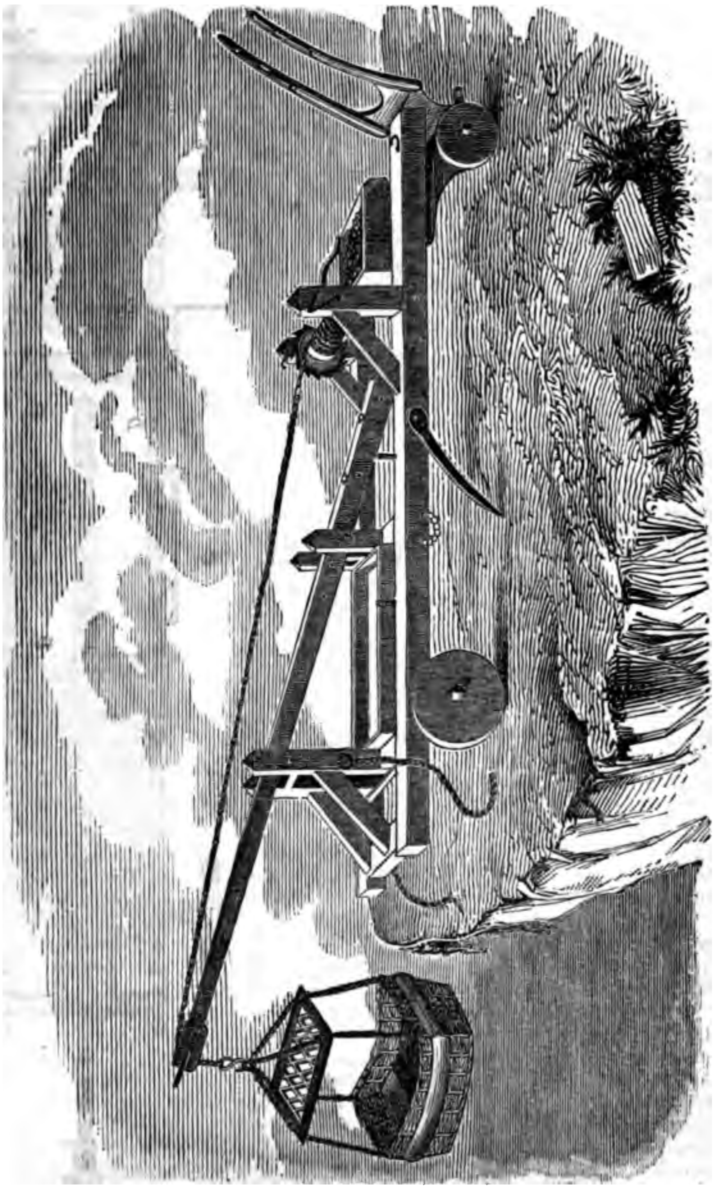


JOHNSTON'S CLIFF CRANE.

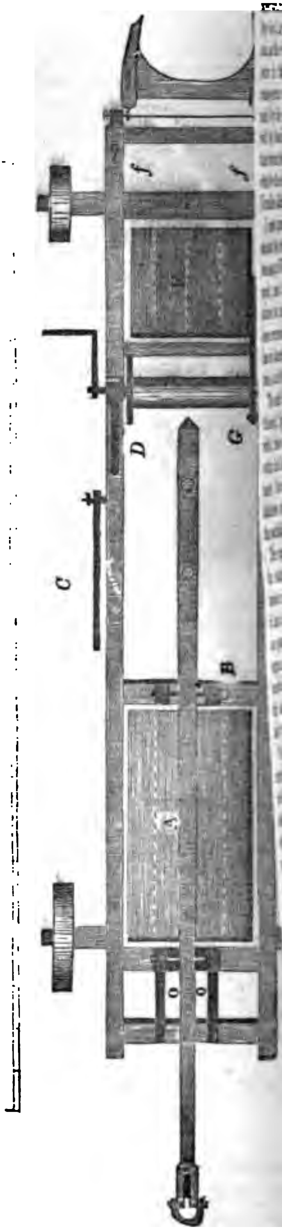
DESCRIPTION OF CLIFF-CRANE FOR THE RESCUE OF PERSONS SHIPW INVENTED BY JOHN JOHNSTON, ESQ., OF BRIGHTON.

(For the *Mechanics' Magazine.*)

The machine which is the subject of the present notice is especially applicable to such parts of our coasts as consist of abrupt and perpendicular cliffs, washed by the waves, which preclude the possibility of rescuing any ill-fated mariners that may be stranded at their feet, except by mechanical means from above. A most important consideration with respect to any machine contrived for such a purpose is the absence of all that is complicated; simplicity of construction being, doubtless, the surest guarantee for successful operation. This will appear the more evident, when it is borne in mind, that if ever called into action, it would probably be amidst scenes of confusion and distress—perhaps too in the darkness of the night. In such cases it too frequently happens that more zeal is shown than discretion—all are eager to lend a helping hand, but few aware *how* assistance may best be rendered; and under such circumstances, complicated tackle of any description might not only render abortive the means of relief intended, but in all probability lead to fatal results. Against these fearful contingencies, the inventor of the present apparatus appears to have effectually provided. Simplicity and power are at once combined in this machine. There is nothing to adjust, which can lead to confusion or failure, while no less than four individuals at a time, may with ease be raised or lowered in the carefully-constructed cradle attached to the machine. Nor is it in saving life alone, that Mr. Johnston's apparatus may be rendered available. Property as well as human beings may be rescued from destruction by its simple, but effective machinery.

The accompanying perspective view and plan (fig. 1 and 2,) which are copied from the Report of the Royal Humane Society for the present year, exhibit the construction of the apparatus and the mode of working it so clearly as to require but little explanatory description. A is a box or well for rocket or mortar apparatus, if required. B, pin-bolt for securing or adjusting the beam. C, spar-shores or stays. D, catch-wheels attached to roller. E, ballast-box; *f f*, hooks for attaching hand-ropes to assist in the

Fig. 2.



draught if necessary. O O, roller over which the crane-beam runs. G, press-lever. The wicker cradle, the dimensions of which are 3 feet 6 inches, by 2 feet 8 inches at top, and the depth 2 feet 4 inches, is fitted with light iron grating for the bottom, as offering less resistance to the upward current of wind in its descent. Canvass fenders, stuffed with cork shavings, pass round the sides. A strong net-work protects the heads of the occupants. The seats are placed low and are moveable at pleasure. Ropes to prevent falling over the cliff are added. As the machine is adjusted in the engraving on the front page, the rope will clear the face of the cliff about 6 feet, but by running out the beam to the last bolt-hole, it would clear the cliff 12 feet. On the cradle or basket being drawn to a level with the surface, the machine is intended to be drawn backwards bodily; so as to land the rescued in safety; and then again moved forward for further operations.

The cost of the apparatus, which, by order of the Committee of the Brighton Branch of the Royal Humane Society, has been established there, amounted to scarcely 40*l*., including the crane-rope, and the whole of the auxiliary appendages; but this sum is exclusive of the shed prepared for its reception. The machine itself has been built in a most masterly and workmanlike manner, and is braced with iron in every part where greater strength is required; the main beam especially being strengthened throughout, by an iron band, or plate, screwed to its upper surface to prevent the possibility of its yielding in the event of any extra weight being imposed upon it.

Let us venture to hope that in a maritime country, such as the United Kingdom, around the coasts of which the most appalling shipwrecks are of such frequent occurrence, the excellent example set by the philanthropists of Brighton in the erection of this useful apparatus will not be lost sight of; and that wherever similar local circumstances exist, and under the favoring auspices of benevolent and influential individuals, Associations may happily have been formed with a view to the preservation of the lives of our brave mariners, the Cliff Crane will, ere long, be in universal use. S.

Note.—We are requested to notice a small im-

was led, in consequence, to inspect the engine very minutely.

The engine No. 18 is mounted on four wheels; diameter of the driving wheels 5 feet 6 inches; that of the others (or fore-wheels) 4 feet; the framings and bearings are inside the wheels. I found the fore-axle cut through about 3 inches inside the bearings of the near wheel; the longer section of the axle had dropped about half an inch below the shorter one. As I had expected that the bearing was sufficiently broad to retain the axle in its truly horizontal position, even when cut through, I made particular inquiries as to the state of the brasses, and was informed that they were much worn; in fact, the engine had been sent into the shops for the express purpose of having them renewed, but that it had been determined to try the experiment before the execution of any repairs.

After satisfying myself on these points, I went to Pinner Park gate, to inspect the position of a proposed new station; whilst there No. 18 came up, with a train of six loaded goods' waggons. I got on the engine, and when we had proceeded about six miles, we ran off the road; the speed at the time was from 15 to 20 miles an hour. The engine went about 200 yards before it was brought to a stand, striking, in its passage, against the chairs and sleepers with great violence. It was evident from the motion that for some considerable portion of this distance, the engine was fairly forced forward by the momentum of the train behind, none of the waggons of which, or the tender, having followed the engine off the road.

On examining the engine after the accident, there was no appearance of any derangement of the machinery; the tires of the wheels were deeply indented by coming in contact with the chairs.

The engine maintained her vertical position, was replaced upon the rails in about 20 minutes, and proceeded to her destination. Whilst upon the journey, I did not notice any unusual motion; and had I not seen that the fore-axle was severed, I should not have been aware of the fact.

On the whole, I consider the experiment as highly satisfactory, for although I did not expect that the engine would have gone off the road, yet her having done so was a much more satisfactory test of its safety as a passenger engine, than could otherwise have been attained.

Had there been anything in the construction which would render it liable to upset, I feel persuaded that the violent action of the train against the foot-board must have produced that result. And as this point could never have been determined until an engine

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To R. Creed, Esq.

London and Birmingham Railway Office,
Wolverton Station, May 25, 1842.

My Dear Sir,—I send, for the information of the Board, the particulars of an experiment which was made on Monday and Tuesday last, at this station, on engine No. 18; and as the result proves that a fracture may occur in the fore-axle, without any serious consequence to engines of the description used by the company, I doubt not that it will be found exceedingly interesting at a time when the public mind is so much excited by the recent accident on the Paris and Versailles Railway.

I must premise, that engine No. 18 was selected for the experiment because she had been sent to Wolverton to undergo a thorough repair; and it was further decided to substitute for her fore-axle one which, having been erroneously made a quarter of an inch less in diameter than the prescribed dimensions, had been long since laid aside.

The axle thus selected was cut circularly through, by a tool three-eighths of an inch wide, close to one of the journals, and to within half an inch of the centre of the diameter, leaving, therefore, an intervening thickness of one inch of metal connecting the partially severed parts.

The engine, in this state, was sent from the station towards Roade; the fore-axle broke in two as intended, at the point where it had been divided, but the occurrence had no apparent effect on the movement of the engine, which continued its course till it reached Roade, when it was crossed from the down to the up line, and returned in safety to Wolverton.

On Tuesday, at half-past one p.m., the engine, with its divided fore-axle in precisely the state in which it had been left the day preceding, was started from Wolverton, with six waggons of wheels and axles—making a gross load of 32 tons, exclusive of engine and tender. With this load the engine attained a speed of 25 miles per hour, and arrived safely at the Watford station, distant 34 miles. Soon after leaving Watford, and when it was again running at a speed of 25 miles per hour, one of the front wheels slipped off the rails, and the engine was delayed seven minutes until it was replaced. The engine again proceeded towards London; but at about two miles beyond the Harrow station, where the line is on transverse sleepers, the wheels once more slipped off the rails, and the engine, in that state, ran upwards of 200 yards before it was stopped. In 20 minutes it was again lifted on to the rails, and started for Camden Town, where it arrived in safety before five o'clock.

This experiment, tried as it purposely was

on an engine thoroughly out of repair, with a divided axle reduced three-eighths of an inch in length, and more likely, therefore, to slip off the rails, may be considered to have established the important fact that the company's engines are not liable to fall down because a fore-axle may by possibility break.

The circumstances connected with the experiment are not likely to occur in ordinary practice, for the following reasons:—

1st. The engine was in a state to require that it should be taken off the road.

2nd. The fore-axle was below our standard size. And,

3rd. It was cut in two in the place most likely to cripple the engine if a fracture were to happen, but not where it would probably take place.

In conclusion I have to observe, that from July, 1837, when the line was opened, to the present period, there has not been a single instance of an accident to our fore-axles; that where crank axles have broken, the engine has invariably been driven on its own wheels to Wolverton for repair, and in most instances has taken its train to a station; and I may add, that of the few cases of fractured cranked axles *two only* have occurred to passenger engines.

Thus the following important facts may be regarded as established:—

First—That of the engines in use on the London and Birmingham Railway the fore-axles have *never* been broken.

Second—That when experimentally broken under the most unfavourable circumstances, the engine was not disabled. And,

Third—that in the only two cases where the crank axles of passenger engines have been broken the engines were not disabled.

I am, dear Sir, yours, faithfully,

(Signed) EDWARD BURY.

To E. Bury, Esq.

London and Birmingham Railway,
Camden Town, May 30, 1842.

My Dear Sir,—I was at Wolverton on Tuesday the 24th instant, and saw engine No. 18 preparing to start on an experimental trip to Camden station.

Mr. Parker, foreman of the shops, informed me, that by your directions the fore-axle of the engine had been cut through, for the purpose of ascertaining, 1st, whether the engine would, in that state, keep the road; and 2nd, in case the engine did get off, whether it would roll over, or retain its vertical position.

Although I had myself no doubt as to the results of the experiment, yet being aware that they would, in all probability, have an important effect in establishing or condemning the use of engines of this construction, I was led, in consequence, to inspect the engine very minutely.

The engine No. 18 is mounted on four wheels; diameter of the driving wheels 5 feet 6 inches; that of the others (or fore-wheels) 4 feet; the framings and bearings are inside the wheels. I found the fore-axle cut through about 3 inches inside the bearings of the near wheel; the longer section of the axle had dropped about half an inch below the shorter one. As I had expected that the bearing was sufficiently broad to retain the axle in its truly horizontal position, even when cut through, I made particular inquiries as to the state of the brasses, and was informed that they were much worn; in fact, the engine had been sent into the shops for the express purpose of having them renewed, but that it had been determined to try the experiment before the execution of any repairs.

After satisfying myself on these points, I went to Pinner Park gate, to inspect the position of a proposed new station; whilst there No. 18 came up, with a train of six loaded goods' waggons. I got on the engine, and when we had proceeded about six miles, we ran off the road; the speed at the time was from 15 to 20 miles an hour. The engine went about 200 yards before it was brought to a stand, striking, in its passage, against the chairs and sleepers with great violence. It was evident from the motion that for some considerable portion of this distance, the engine was fairly forced forward by the momentum of the train behind, none of the waggons of which, or the tender, having followed the engine off the road.

On examining the engine after the accident, there was no appearance of any derangement of the machinery; the tires of the wheels were deeply indented by coming in contact with the chairs.

The engine maintained her vertical position, was replaced upon the rails in about 20 minutes, and proceeded to her destination. Whilst upon the journey, I did not notice any unusual motion; and had I not seen that the fore-axle was severed, I should not have been aware of the fact.

On the whole, I consider the experiment as highly satisfactory, for although I did not expect that the engine would have gone off the road, yet her having done so was a much more satisfactory test of its safety as a passenger engine, than could otherwise have been attained.

Had there been anything in the construction which would render it liable to upset, I feel persuaded that the violent action of the train against the foot-board must have produced that result. And as this point could never have been determined until an engine

with a broken axle had run off the rails, the experiment was so far conclusive.

I believe that if the brasses had been in good order, or if the axle had been cut away at the back of *both* the wheels, and *removed altogether*, the engine would not have gone off the road; for the tendency of the longer section of the axle was to throw the wheel to which it was attached out of its vertical position, and to bring the flanch in close and continuous contact with the rail, thus greatly increasing the probabilities of the wheel mounting the rail on meeting with any obstruction, however small.

I am, &c. &c.

(Signed) ROBERT B. DOCKRAY.

We said last week that "the next thing *of course* would be to dispense with axles altogether." We have been accused of levity in so speaking, but our readers will see that the "Man Friday" who here backs his master in such capital style, is, with all the earnestness in the world, quite of our opinion. The only accident which happened to the carriage with its broken axle was the running off the rails, and "Man Friday" says, "I believe if the brasses had been in good order, or if the axle had been cut away at the back of both the wheels, *and removed altogether*, the engine would not have gone off the road." The experiment, therefore, was faultless in all but the single particular of the axle not being "removed altogether." Had it been only removed altogether, there would have been no running off the rail —*no axle, no accident!*

How idle then to entertain any fear of breaking axles! All who are troubled with such fears have only to break them before starting, or still better, have none to break. The jester's well-known remedy for burglary is nothing to this. "Leave your doors open," quoth the jester. "Have none at all," is the maxim of our modern jester, "Robert B. Dockray."

Logicians allow that there is such a thing as proving too much, and common sense people intend something to the same effect when they say that "you may have too much of a good thing;" but at railway *head*-quarters there is something a vast deal better than either logic or common sense—there is that "stubborn thing" called "fact," which "dings a' " and may *not* "be despised." *No axles and no accidents* against all the logic and common sense in the world!

The English sailor who made a summerset from the mast-head and did not break his skull, bade the envious Dutchmen "do the like if they could." And even so it is with Mr. Bury's Man Friday —having miraculously survived his ride in the broken axle carriage, he bids all heavy a-xled engineers learn wisdom from his example, and bother themselves with axles no more!

The wonderful success of these wonderful experiments may furnish a useful hint to others besides railway engineers. When that respectable and enterprising class of mariners yclept "free traders" are hard pressed—running before the wind with every sail set—it is a common practice with them to knock away the wedge-pins from the masts, in order that they may have freer play, and if that does not suffice, then to saw through a number of the timber heads (it would almost seem from this as if Mr. Bury had stolen a leaf out of their log). But by the same rule that an axle cut through is as good as a whole one, and no axle at all better than either, it follows that the surest way to escape would be to cut away the masts by the board, and remove the timber heads "altogether." If this be not good, sound, practical reasoning, it will at all events do to "tell to the marines."

The running off the rails was an ugly incident to be sure; had it been on a high embankment, or in a deep tunnel for example, it would have knocked the Man Friday into Saturday at least. But Friday shows clearly enough that it was all owing to his master's grand and original ideas on the subject not being carried out to their full extent. Had the axle been "removed altogether," nothing of this untoward sort would have occurred. The danger to be apprehended is not so much from breaking axles as from not breaking them enough. Broken into two pieces they are admitted to be a little dangerous, but broken into a million, they exhibit the very perfection of safety. Mr. Bury's *beau-ideal* of an axle is an axle of saw-dust!

Worthy of all admiration is the bold manner in which Mr. Bury has, in this particular, made head against the vulgar outcry. Some persons, of the weak stuff of which ordinary men are made, would have assented to the danger to be apprehended from the breaking of axles, and

sought to soothe the public mind by talk of providing against it. Not so Bury; he stoutly denies the danger gether," and at the risk merely of ng mincemeat of his Man Friday, nother helper or two, he proves to beyond the possibility of dispute, ll your fears are vain.

long life to the bold Mr. Bury! long may his four-wheeled Jugut manufactory endure and flourish.*

LAND'S PROPELLER AND THE CAMBRIAN (JONES'S) STEAM-ENGINE.

—I quite agree with you as to the ety and fairness of considering Mr. nd's propeller, and his mode of con- the power of the engine to it by and bands, instead of toothed wheels, t and parcel of one invention; neither lisposed to question the correctness of dgment you have pronounced as to united capabilities. But I must beg as one of *the public* (merely), to put ase: suppose a simple and efficient were discovered of conveying the *direct* to the propeller, without the ention of either bands or toothed , would it be right that the public be excluded from the adoption of node because of the duality of Mr. nd's patent? Must we either make Mr. Blaxland's propeller in conjuncith his peculiar gearing, or not use it If this be really the case, then I can say it is a great pity—a pity on Mr. nd's account, and also, perhaps, a n account of the public; for certain it t there are engines—though, to be he invention of yesterday only—which onvey the power direct to the prowithout the intervention of any sort aring whatever, and equally certain f we may not use these engines in tion with Mr. Blaxland's propeller, ll be obliged to have recourse to some propeller, though possibly not by any so good.

hese remarks, Sir, I have particularly eye the Cambrian engine, invented by the ingenious Mr. Jones, of Smethwick, and which you have yourself in your Notices to Correspondents of the 28th May last, been pleased to characterize as "one of the best which has yet come out."

From the manner in which the postscript account of the experiment with Mr. Blaxland's little *Jane* on the river Lea is given at the close of your report of the trial on board of the *Swiftsure* in the Mechanics' Magazine of the 4th inst., I infer that though present at the latter, you were not so at the former; and this inference excludes a suspicion which I might otherwise have been disposed to entertain of your impartiality. For by another account of the river Lea experiment which I have before me, (that of the *Hertford and Bedford Reformer* of May 28,) I find that the applicability of the Cambrian engine to canal and river navigation, from the direct nature of its action, was brought almost as prominently under the notice of the gentlemen present as the merits of the Blaxland propeller itself—*though your notice is perfectly silent on this point.* The *Hertford Reformer's* account mentions, among those who were present on the occasion, "*Mr. Crosley, the patentee of the new Cambrian engine,*" (*one of the proprietors of the patent*, would have been the more correct designation,) and it quotes Mr. Crosley as giving the following account of the engine:

> "The patent engines suitable for barges of 50 to 60 tons, should be of about six-horse power, either of *high pressure*, or *high pressure expansive and condensing*, about the same space being required for either, namely, 3 feet in length, 18 inches breadth, and 2 feet in height—the weight, about 12 to 15 cwts., without boiler, which would also be of small size, calculating the weight altogether at about 1½ ton. The consumption of fuel is less than that required for engines of the same denomination of the usual construction; and a still less consumption, if engines of high pressure, expansive and condensing, were employed. The cost of the latter would be about a half more. But the great advantage possessed by our engine is, that *it can be connected direct, and without gearing or intermediate motions, to the shaft of the propeller, the speed of which will be the same as that of the steam engine*, which is variable at pleasure."

The words of this extract, which I have marked in italics, may perhaps serve to explain why all about the Cambrian engine, and its direct action, was so ***studiously omitted*** in the account with which you were furnished of the river Lea experiment.

However, it is not by such small manœuvres as this that the merits of the Cambrian engine are to be kept in the shade. Since the river Lea experiment, a deputation from the body of canal proprietors has paid a special visit to Mr. Jones's factory at Smethwick, to inspect some engines which he has completed on his plan, and from the satisfaction they expressed with them, there is little doubt of their soon having a trial on

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* have seen a business circular of Mr. Bury's able firm which shows that, after all, he and ve a shrewd suspicion that the days of the four rs are numbered. After stating what they con- be the advantages of the four-wheeled enthey wind up with these remarkable words, stice to ourselves we have thought it right to e remarks before the public, at the same time *are quite ready* to construct *engines upon any other number of wheels*, freeing ourselves he responsibility of the consequence of any plan than our own, and only requesting that our friends and the public as may entrust rders to us, will permit us at least, for the *f travellers and our own credit, to adhere to aming.* BURY, CURTIS, AND KENNEDY."

some of our principal canals—with or without the Blaxland propeller, as the case may be. I am, Sir, yours, &c., S.

[Our correspondent is right in supposing that we were not present at the river Lea experiment, and were not aware of the omissions of which he complains. We have a description of the Cambrian engine in hand, and hope to be able to give it next week.—Ed. M. M.]

WHITELAW AND STIRRAT'S WATER MILL.

Fig. 1.

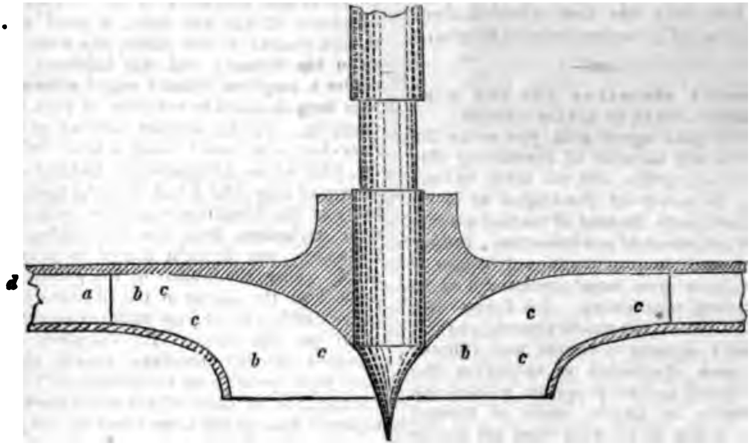
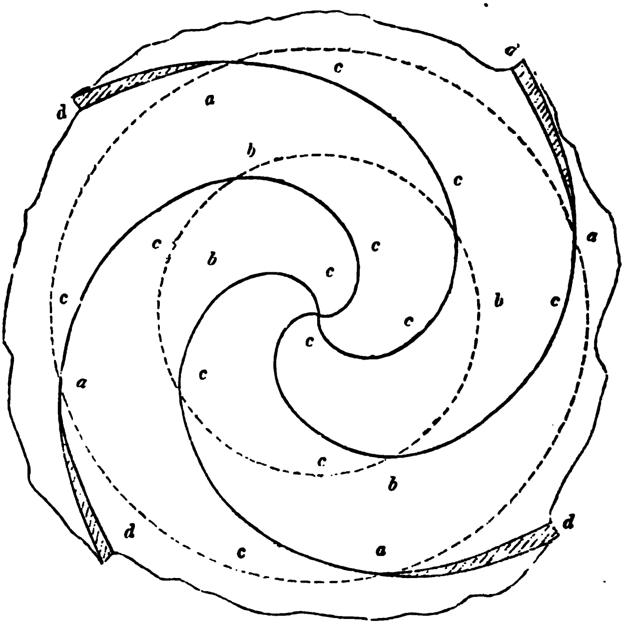


Fig. 2.



Sir,—Some time ago, I had the pleasure *of examining* a water-mill constructed by Mr. Whitelaw; and as I liked very much the formation of the parts abo

the central opening, I believe the following description may also be acceptable to many of your readers.

Fig. 1 is a vertical section, and fig. 2 a horizontal section of the central parts. The division pieces *d a*, *d a*, *d a*, *d a*, which form the four arms, or water-spaces, do not run inwards so far as the central opening, but they terminate in sharp ends at *a a a a;* and the whole of the space *b b b b*, which is inside of the inner ends of the division pieces is so proportioned, that the speed of the water passing through it will be uniform, or nearly so, at each point of its passage, for the purpose of allowing the water to enter the arms without any shock, when the machine is in motion. This is a very excellent plan where there is always a sufficiency of water to supply the whole of the arms; but when a machine is made for a situation, where occasionally there is water not for the whole of the arms but sometimes only for three, two, or one arm, Mr. W. proposes to put plates, curved in the manner shown by the lines marked *c c c*, in fig. 2, into the space *b b b b*, (see also fig. 1,) and thus each space betwixt a pair of plates will conduct the water into an arm. When the space, *b b b b* has certain dimensions, it may be found necessary to skew or twist the plates *c c c*, in order to allow the water to enter the machine when in motion, without interruption. These plates may require to be twisted from other causes. The smaller dotted circle shown in fig. 2, gives the size of the central opening; and the inner ends of the arms, when the plates marked *c c c* are not used, terminate at the large dotted circle, in the same figure. The plates, marked *c c c* may not run inwards so far as the centre of the machine, and their inner ends may run from the edge of the central opening upwards and towards the centre; or the innermost points of these plates may meet at *e*. At and near to the central opening, the water may be allowed to flow somewhat quicker than it does at the other points of its passage through the space *b b b b*, to allow for the change of its motion from the perpendicular to the horizontal direction, and for other causes.

I am, Sir, yours, &c.

J. C.

Glasgow, May 27, 1842.

THE FOREST OF DEAN COAL AND IRON MINES—AWARD OF THE COMMISSIONERS.*

The Forest of Dean comprehends an irregular area of about thirty miles in circuit, lying between the rivers Severn and Wye; covered for the most part with timber, in various stages of growth; and famous for its mines of coal and iron. From time immemorial, all male persons born in the hundred of St. Briavels, in which the Forest is included, have enjoyed the right of working these mines, subject only to the leave or licence of the gaveller, or deputy gaveller of the Forest being first obtained, and to the payment of an annual galeage rent, or duty to the Crown. In default of, or in lieu of such payment, the Crown was entitled to put in a fifth man for a share with other four men (free miners), after the coal or iron had been won by means of a shaft or level, in the working of which the Crown's fifth man was not required to assist. In ancient times the practices of the free miners, as regards the opening and working of mines, and the carrying of coal or iron ore, were regulated by a court or jury of free miners, who met at what was appropriately called *The Speech House*, in the centre of the Forest, and adjudicated on all such matters. Some records of this Court of Free Miners, extending over a period of eighty-six years, from 1688 to 1754, are still preserved in the office of Woods and Forests; but from these records it appears that the Court was never at any time adequate to the purposes of its institution, and eventually it became extinct. For more than half a century afterwards the free miners appear to have done very much as they pleased amongst themselves; for though the old customs were always referred to, as furnishing the rules by which the agents of the Crown and the free miners were to be guided, yet these customs had constantly to be modified to suit new circumstances, and were wholly inapplicable to the deep coal mines worked by the aid of modern machinery. The perplexity of this state of things was much

* The Award of the Dean Forest Mining Commissioners, (under the 1 and 2 Vict. c. 43,) as to the Coal and Iron Mines in her Majesty's Forest of Dean, and the Rules and Regulations for working the same, &c. By Thomas Sopwith, F.G.S., the Commissioner appointed on behalf of the Crown. With Map. 210 pp. 8vo. Weale, London.

increased by a new practice of the free miners, which appears to have been very rarely, if at all, practised during the period of the Mine Law Courts; this was the practice of free miners selling or assigning, for long terms of years, gales, to persons not being free miners, and who were generally known in the Forest by the term "foreigners." Among these "foreigners," the well-known names of Crawshay, Protheroe, and Mushet, stand conspicuous. It is certain, however, that but for the intrusion of these "foreigners"—but for each adventurer of that class consolidating in his person the individual rights of a number of the native miners, and but for the large capital which they introduced into the Forest—the deep mines, which are the richest, would never have been reached and worked at all. According to ancient custom, no gale could be granted within 1,000 yards, either in advance of the level, or on the land side of an existing work, or within a circle of 12 yards radius to a water pit; but these restrictions allowed of twenty, forty, or even a hundred gales being granted within the scope of a tract of deep coal, large enough to justify the expenditure of from 5,000*l.* to 10,000*l.* in the sinking of a shaft to reach it. Besides, shafts could only be sunk, and engines and machinery erected with the consent of the Crown, as the owner of the soil; and in granting that consent, the Commissioners of Woods and Forests claimed a right to exercise a reasonable discretion without any reference to the old custom of galing. To work all the gales separately, would have been useless and ruinous, and many existed in such isolated situations as to be for all practical purposes utterly valueless. Again, according to the common acceptation of the privileges conferred on free miners, or their assigns, by a gale, it was understood that the workings of a coal or iron mine, might be carried to an indefinite extent, (that is underground,) unless interrupted by another work; so that where a free miner or a foreigner once penetrated to a deep coal vein, he virtually obtained the monopoly of a very large tract of coal, by the power which he possessed of extending his work, before any rival pit could be sunk. With custom and legal title thus at variance, it became at length absolutely necessary that the legislature should interfere to adjust and determine the rights of the various parties interested. An Act of Parliament was accordingly passed, 1 & 2 Vict. c. 43, by which Thomas Sopwith, of Newcastle-on-Tyne, (on the part of the Crown); John Probyn, of Gloucester (on the part of the miners); and John Buddle, of Wallsend (as umpire); were appointed Commissioners "to ascertain what persons were, at the passing of the Act, in possession of, or entitled to, gales, for coals or iron mines within the hundred of St. Briavels, or stone quarries within the said Forest, or of any pits, levels, or other works, made by virtue of gales, for the purpose of working the coal and iron mines of the said hundred," as also "to set forth general rules, orders, and regulations for working the same" in future.

The Commission was opened at Coleford, on the 5th September, 1838, and finally closed at the same place on the 26th of July, 1841; and the Award of the Commissioners has now, by order of the Commissioners of Woods and Forests, been printed under the superintendence of Mr. Sopwith, for the benefit of all concerned.

The labour of the Commissioners has been prodigious; and, as far as we are competent to judge, it has been executed with great ability, discrimination, and fairness. The number of free miners registered (1 Nov. 1841) is 829, and that, we presume, may be taken as an index to the least number of claims adjudicated upon.

Of the general views by which the Commissioners were guided in the execution of their task, Mr. Sopwith gives the following satisfactory exposition:—

"From these various considerations, it will be seen that the peculiarities of the Dean Forest customs were such as to preclude the application of any remedy, save that of discretionary powers based on the plain principles of common justice to the owners of the several properties, and of reasonable compensation in every case of inevitable loss or injury. Mining is, under all circumstances, a very speculative subject, as regards prospective valuations; and the peculiar and irregular practices in Dean Forest rendered it most difficult to define express rules. In most mining districts, the customs are tolerably well agreed upon; and there are, in addition, grants or leases which afford a guide in a legal point of view; the ownership is usually clear and undisputed; the financial matters are also usually well defined; the cost of sinking and work-

unencumbered with indirect and payments, as in the purchase of ıd the payment of a rent, which ered a minimum rent by the diffi- ipplying the only remedy, viz., the ı of a fifth man. In mining districts , it is usual to have definite tracts ıd protection from adjacent works; ean Forest, all these were hitherto there were no clear legal rights to f or allot, more than a mere spot, of twenty-four yards in diameter of coal. There were no means of es- a colliery with an absolute cer- a safe investment; and the want iite tract, the liability to encroach- l the flowing of water from adjacent nded to create great confusion even e-drainage works, and to make the es comparatively valueless.

owners of the large mines could, as istricts, have secured an equivalent coal, the difficulty of arriving at a y conclusion would have been lessened. But this in practice o; the custom of galing, in many upied coal which might have been y expected to be worked by other The Mining Commissioners atten- nsidered the various suggestions been made; and after a deliberate on of the circumstances of each nsition from the then impracticable to a rational and provident system has been effected in the Forest of

leep workings lie at a considerable n the surface of the lowest valleys, below the level of the sea; land or ıage is therefore precluded. The ound with water, which, from so pth, cannot be drawn without the rse-gins, or manual labour; and mines are deep, and the quantity such as prevails in the mines of est, steam-engines and machinery ensable.

at expense attendant on such works it necessary that tracts of coal of corresponding to the outlay of ıould be awarded. After much liberation, and having a due regard ıerous, important, and complicated ıvolved, the Mining Commissioners this service, and set forth the Coal and Iron Mines as contained owing pages."

rand and happy result is that—

privileges of the free miners, which g period were subject to great un- are now established on a firm *instead of the vague* and indefinite *galing as practised* for some centuries past, the possession of distinct tracts of coal and iron mine is secured to the parties respectively entitled to claim such minerals."

The mode adopted of mapping the mineral fields, which are the subject of this Award, is excellent, and well deserving of imitation by all who are largely concerned in mining property. In 1835 an exact surface and subterranean survey of the Forest of Dean was made for the Commissioners of Woods and Forests, by Mr. Sopwith, whose qualifications for the purpose, as most of our readers are no doubt aware, are of the very highest order. The maps then supplied by Mr. Sopwith were afterwards engraved, and made the basis of the Commissioners' Award. Of these plans there are sixteen on separate sheets, all of the same size; one is an index map of the whole Forest, and each of the remaining fifteen, which are on a scale four inches larger, comprises an area of four square miles.

"The index map inserted in this volume, forms the sixteenth sheet of the entire series, each sheet being of the same dimensions as the index map, and numbered so as to correspond with the small squares on the latter. The scale of the index map is 2½ inches to one mile; each compartment, therefore, comprises four square miles, and each sheet of the large map in detail contains in like manner a separate area of four square miles, the scale of the map being ten inches to a mile, or eight chains, to an inch. By means of the index map, therefore, any one may ascertain what particular square or squares of the larger map are wanted in illustration of the mining operations in any part of the Forest. These sheets are printed on stout drawing paper, so as to admit of any additional planning being laid down; and a broad margin is left on one side for the purpose of inserting any remarks, drawing sections of strata, or other details, which would encumber the area of the plan, but which it is desirable should be seen in connexion with it. * * * The first sheet contains equivalent scales of chains and yards, and on every sheet a scale of chains (22 yards) is engraved on the intersecting lines which divide it into four parts (square miles). By this means any contraction or shrinking of the paper is attended with a like reduction of the scale engraved thereon, which therefore always retains its relative proportion to the object represented by the plan."—pp. 34—36.

Any of the 16 sheets here alluded to, may be bought separately (of Mr. Weale) at the very moderate price of 2s. per sheet.

THE SMOKE NUISANCE.

(Victoria Gallery, Manchester.)

At the *conversazione* on the 8th instant, the subject was a communication by Mr. C. W. Williams, on the Smoke Nuisance and the erroneous mode of testing the several Smoke-preventive Plans. After some general observations, Mr. Williams proceeded as follows:—

"The Leeds meeting, in which I, in common with so many others, took no small interest, and from which I had entertained high expectations, has unquestionably failed in effecting that result which its promoters anticipated. One important result has certainly emanated from that meeting, namely, the producing a more lively attention to the subject, and a stronger feeling in favour of its ultimate success. To Mr. Eddison, who originated and carried out the measure, and Mr. West, who with no small labour compiled his pamphlet, the thanks of the community are unquestionably due. The prevailing feeling, however, on the part of the public, appears to be *disappointment.* It was expected, that some tangible and effective measure would have emanated from so influential a body; that something of a positive character would have been undertaken towards working out the object for which the meeting was held; and that an association would have been established, or a committee of scientific and practical men appointed, for the purpose of devising such measures as would have assisted the willing, aroused the languid, and coerced the reluctant into adopting some practical remedy in abatement of the nuisance so universally admitted and deplored. Such measures would at least have afforded some clue to guide the unscientific, and enable the great mass of sinners and sufferers to see their way out of the labyrinth of expedients by which they have been so long bewildered.

"The Leeds meeting began, in my opinion, at the wrong end. They began by drawing together the numerous claimants for public favour; calling on them to submit their inventions to a manifestly incompetent tribunal, and almost inviting each to panegyrize himself and his plans. In my opinion, that meeting should have gone further, by the appointment of a small working committee, who would to a certain extent have relieved the subject from its present state of obscurity and complication. So far, however, from narrowing the field of uncertainty, manufacturers now find the difficulties of their position increased by having placed before them indiscriminately such a host of inventions. What the public required was, not *to have*, on the authority of the Leeds meeting, this collection of 40 or 50 plans, in which they find it impossible to separate the wheat from the chaff; but to have had the aid of a judicious and competent committee to assist them in making a selection.

"I here propose alluding to some of those points to which the attention of a committee may be safely directed; and thus, while they advance the general object, avoid a bootless search after what they cannot discover. The danger is, that by taking a wrong course at the beginning, they may not only lose sight of what is practicable and useful, but get entangled in what may neutralize their well-meant efforts, and thus damage the cause we are all so anxious to promote. The objects to which the attention of the committee may safely be directed are—The ascertaining to what extent the prevention of the nuisance of smoke may be practicable—to what class of fires and furnaces improved principles of combustion may be applied—what would be the safest course of proceeding towards compelling parties to mitigate, if not wholly prevent such nuisance—to what extent a compulsory jurisdiction may be applied, and what available statutory regulations it would be advisable to adopt; and how far it would be just to compel the adoption of remedial measures, until such were specifically determined and pointed out.

"But perhaps the most valuable fruit of such a committee would be its relieving men of business, who have not leisure for deliberate experiment and inquiry, or who are incompetent to decide on the claims of rival inventors; and thus aiding them in their search after what is best. To relieve this valuable class of the community, such an association might undertake to hear the several inventors describe their respective inventions, and form an opinion as to their merits: much useful information would thus be obtained and recorded. A tribunal would be formed to which the great body of manufacturers would look with confidence, and to which patentees would refer their claims and alleged proofs of success. Should any decline such an ordeal, and refuse to submit their plans to a body of scientific and practical men, they could not afterwards claim the attention of the unscientific and uninformed. Such an association would be worthy this great manufacturing metropolis.

"I will now allude to some of those sources of error into which we are most apt to fall in pursuing our inquiries into the mode of effecting combustion so as to prevent smoke. The common feeling unfortunately is, not so much a philanthropic desire to abate the

nuisance of a smoky factory, but a money consideration of the advantages to be obtained by such abatement; and it will not be denied, that economy may induce many to undertake what philanthropy would in vain have urged them to attempt. Falling in with this weakness, inventors find the readiest road to the ear of manufacturers to be the promise of economy in the measures they propose. Many indeed broadly say,—"What do I care for the smoke my factory chimney makes? I do no more than my neighbours; but, if I allow you to try your plan, *what saving will it produce*, how much less fuel shall I consume, or how much more steam will my boiler produce?" Thus the individual whose nuisance is to be abated requires to know, not how much he is to pay for abating it, but how much he is to gain if he undertakes it.

"We are not, however, to treat the nuisance-makers as we would a set of truant children, and promise them the sugar plums of economy and savings if they will but abstain from doing mischief, and infecting the atmosphere of our towns. This would be unworthy of both. It is the business of a committee to say, that a public nuisance exists—that it may be abated—and that the public good demands that it should. There can be no objection to add, as a justification for recommending coercive measures, that, having investigated the several proposed methods, it appears that more or less of economy will certainly attend the adoption of remedial measures. The relative *degrees* of economy, however, or its direct causes, it is not for them to determine, inasmuch as they depend on a variety of circumstances wholly foreign to their object. This is an important point, and I will illustrate it by some examples.

"Improved *combustion* and improved *evaporation* are as essentially different, as the action of the copper of a still differs from that of its condensing worm. The evaporative effect of the former may far exceed the condensing power of the latter. So the improved state of a *furnace* may find no corresponding improvement in the *boiler*. The error of estimating the value of any proposed system of combustion by the quantity of steam generated, is dangerous and defective, and should be carefully avoided. Something of the kind appeared at the late meeting in this theatre, though not in the same degree as at the Leeds meeting, where a distinct series of questions were put to each patentee. These were—"How long has your plan been tried? What effect had it on the boilers? What had been the saving of fuel?" Now the mere enunciation of such a course of inquiry offers the most *convincing proof of the* existence of an erroneous view of the subject on the part of the public.

"Were I to suggest queries, such as would elicit useful or necessary information, they should be in this train:—To what extent was visible smoke reduced? Did the interior of the furnace and flues exhibit more or less flame and heat? What means have you of ascertaining whether more or less heat was generated? What was the temperature of the escaping products by the chimney? Was it increased or diminished? Was the draught increased by your system? Was there a greater or lesser concentration of heat in the furnace, or was it more uniformly distributed along the flues? What means have you of ascertaining these several facts, beyond the mere appearance at the chimney tops? Does your plan require any and what adjustment in the admission of air, by valve or otherwise? Does the fire require any particular mode of management?

"A series of such like questions could readily be framed, which would at once test the merits of the several plans. Such a list of questions from the committee would soon be adopted by the public, and to these questions written replies would soon be required. Instead of a series of such questions, the cry is, "What saving will be effected?" Yet the amount of saving to be realized by any plan for effecting a more perfect combustion, depends on many different considerations, and opens a wide and difficult subject. I call on any practical man to show the extent to which an improved system of combustion in the *furnace* refers to an improved system of generating steam in the *boiler*; for in this lies the main question, and our main source of error. I will here illustrate it by a practical reference.

"The experimental furnace and boiler now in Fennel-street, when first erected in Liverpool on the old plan, produced much smoke, and had a bad draught from a narrow, low chimney. The interior of the flues was filled with a dense black cloud of smoke and soot; their temperature was very low, and the evaporative power of the boiler at a corresponding low point. On admitting air to the gases behind the bridge, the whole was changed; the gases which before had been converted into smoke, were now converted into flame, and gave much heat. This was attended with a greatly increased temperature in the flues, and a greater amount of evaporation in the boiler; still the evaporation was low, and apparently disproportioned to the increased quantity of heat generated and filling the flues; yet the combustion was as perfect as possible, and equal to what is seen in the most improved lamp. From an inspection of the interior, by means of sight holes, and from the high temperature and

increased draught apparent in the flues, it was manifest that much of the heat generated by the improved combustion was escaping by the chimney. It was equally manifest, that the boiler was unable to take up the heat generated in the furnace and flues, and thus was the low amount of evaporation accounted for. The mystery was thus at once solved; the fault was proved to lie with the *boiler*, and its limited heat-absorbing faculty, and not in the heat-generative faculty of the *furnace*, which appeared almost perfection.

"Having discovered the disease, I set about devising the remedy. In this case, the evaporation being low, engineers, under the old system, would have recommended *enlarging the fire-grate*. This was the usual and infallible remedy, as we find it laid down in so many treatises, under the old smoke-making system, with imperfect combustion, where the flues did little in producing evaporation, and the heat from the furnace itself, and a few feet beyond it, had to do the greater part of the work. To enlarge the furnace, while set on the old plan, as it would enlarge the radiating surface, would certainly have produced a greater measure of evaporation. In the boiler in question, however, as set on the new plan, it only increased the consumption of fuel, without materially increasing the evaporation, seeing that the flues were already filled with a current of heat beyond what the boiler could absorb. The remedy, manifestly, would have been a new and enlarged boiler, with enlarged absorbing surfaces, thus to take up that redundant heat which was then lost by the chimney. As this was impracticable, the only alternative lay in *increasing the absorbing power of the flue surface*. This was accomplished by the introduction of a series of conduction pins, as already described; and the evaporative effect was at once so considerably raised, that the same quantity of water was evaporated in 21 minutes, which before had required 28 minutes, and from the same weight of fuel. This increased heat-absorbing faculty was also satisfactorily confirmed by the important fact, that the *temperature* of the escaping heat was proportionably *diminished*.

"Now, had I been asked, as Mr. Houldsworth was, at the late meeting, as to the result of the new plan, in the first instance I should have said, that, as far as was evidenced by the generation of steam, the saving was 5 or 10 per cent.; but subsequently, and without any increased consumption of fuel, I must have said 20 or 30 per cent. more. Do we not thus see the danger of considering the question of economy, as indicated by the amount of evaporation, and not sufficiently distinguishing between the functions of the boiler and those of the furnace? Let improved plans of *furnaces* be tested by the increased quantity of *heat* they produce, and the *boiler* by the quantity of this heat which it can apply in the generation of *steam*; but let these two essentially different results be not confounded."

[*To be concluded in our next.*]

IMPORTANT PATENT LAW CASES.

Court of Common Pleas.

June 13.

Crane v. *Price and others.*

The Judgment.

[For a full report of the argument in this case, see *Mechanics' Magazine*, Feb. 5, 1842, No. 963.]

The Court now gave judgment in this important case, which was fully argued two terms ago, when various objections were raised to the patent, the principal one being that the combination of hot blast with anthracite in the manufacture of iron, was not a new manufacture within the statute of James, hot blast having before been used with bituminous coal, and anthracite having been used before with cold blast.

The Lord Chief Justice Tindal, in delivering the judgment of the Court said—"We are of opinion that if the result produced by such a combination is either a new article, or a better article, or a cheaper article, to the public, than that produced before by the old method, that such a combination is an invention or manufacture intended by the statute, and may well become the subject of a patent. There are numerous instances of patents which have been granted where the invention consisted in no more than in the use of things already known, and acting with them in a manner already known, and producing effects already known, but producing those effects so as to be more economically or beneficially enjoyed by the public; as Hall's, "for applying the flame of gas to singe off the superfluous fibres of lace and Derosne's," in which the invention consisted in filtering the syrup of sugar through charcoal, which had been used before in filtering almost every thing except the syrup of sugar; and Hill's patent for the use of slags or cinders, previously considered useless in the manufacture of iron. The only question, therefore, to be considered on the evidence is, was the iron produced a better or cheaper article than was produced before? Upon these points, on looking at the evidence, it appears that the yield of the furnace was more, the nature, properties, and quality of the iron better, and the expense of making the iron less. It was objected that the quality or degree of invention was so small that it could not become the subject of a patent; and that any one, with a licence from

Neilson, had a full right to apply the hot-blast to any coal. But, in point of law, the labour of thought, or experiments, and the expenditure of money, are not the essential grounds of consideration on which the question whether the invention is or is not the subject matter of a patent, ought to depend. For, if the invention be new, and useful to the public, it is not material whether it be the result of long experiment and profound research: or the result of some sudden and lucky thought, or mere accidental discovery.

Judgment for the plaintiff.

Court of Queen's Bench,
June 15.
Sandiford v. *Neild and others.*

This was an action for the infringment of the plaintiff's patent of June, 1838, for certain improvements in the art of block printing, and in the arrangements connected therewith.

The *Attorney General, Mr. M. D. Hill,* and *Mr. Crompton,* were counsel for the plaintiff; *Messrs. Kelly* and *Webster* for the defendants.

The specification described the invention to consist in making light frames of wood or other material, to which moveable patterns were attached, by which means printing surfaces might be formed, having many times the area of the ordinary blocks, and large enough to print handkerchiefs, with border patterns, at one impression, and light enough to be easily managed by hand. The specification also described the invention to consist in a method of arranging the pattern on the blocks in several strips or portions at the same impression, and in completing the impression, by advancing the block forward at each impression by a distance equal to the width of one of these portions of the pattern, so that if the block contained three patterns, the whole impression or print on the fabric would be completed by three impressions of the block.

The defendants used a machine, the subject of a patent granted to Hampson in 1840, also for improvements in block printing, in which the blocks were solid heavy blocks, made in the same manner as the ordinary blocks, but sufficiently large to print a square equal to the width of the piece, and having the pattern cut and brassed on the face of the block, but arranged in six or more portions. A separate colour was transferred to each of these portions by a sieve of peculiar construction.

The block was counterbalanced over a pulley, and moved by the hand, and gave the impression by the blow on its descent. The fabric to be printed was advanced by machinery at each impression a space equal to the width of one portion of the pattern on the block, that is, if the face of the block had a pattern arranged in six divisions, the whole printing would be completed by six successive impressions.

The alleged infringement was, the using these large blocks, having the pattern so arranged as to print over the same portion of the cloth several times; the block at each descent overlaying, with a fresh colour and pattern, a portion previously printed.

The defendants, among other things, pleaded, that the invention, the infringement of which was complained of, viz., the arranging the pattern in a particular manner, and the printing over the same piece of cloth more than once, instead of completing each portion by one impression, was not a manufacture, or the subject of the patent laws.

The counsel for the defendants, at the close of the plaintiff's case, called on the learned judge to direct a verdict for the defendants on these points. They contended that the one part of such invention was a mode of arrangement which might have been the subject of protection by registration, but that any particular pattern, or set of patterns, cut and brassed on blocks in the usual manner, was no manufacture, and that the other part of the invention was a particular mode of using a block which, when combined with appropriate machinery, would be a manufacture; but, unless so combined, could not be considered in law an invention to be protected by letters patent—that in short it was a mere mode of using, which was not of itself a manufacture, though it might be rendered so.

The learned judge reserved these and some other objections, as there were several questions to be disposed of by the jury.

The defendants put in the specification of a patent of Mr. Applegath's, of November, 1836, from which, and the subsequent practice, it appeared that frames having the pattern or blocks fastened to them, so as to be moveable, had been used before the date of the plaintiff's patent; and in which the cloth was advanced in successive portions according to the number of patterns and colours to be printed.

The jury found a verdict for the defendants.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WM. EDWARD NEWTON, OF CHANCERY-LANE, C.E., *for certain improvements in the production of ammonia.* (Communicated by a foreigner residing abroad.) Petty Bag Office, May 9, 1842.

The present improvements in the production of ammonia, consist in producing it

by means of an apparatus of the form ordinarily used for distilling alcohol (an oblong chamber divided by horizontal diaphragms, with valves opening upwards, &c.)

The claim is to the application of any apparatus whose construction and use are such as to cause, by means of diaphragms, liquid containing ammonia in a volatile state, and steam, to pass in mutual contact and in opposite directions, whereby a given quantity of heat is made to liberate ammonia from successive portions of ammoniacal liquor.

William Henry Fox Talbot, of Laycock Abbey, Wilts, Esq., *for improvements in coating or covering metals with other metals, and in colouring metallic surfaces.*—Enrolment Office, June 9, 1842.

These improvements are four in number:

The first consists in adding gallic acid to the metallic solutions intended to be precipitated. Any convenient solution of silver, gold, or platina is taken; and to each of them is added a solution of gallic acid in water, ether or alcohol (the last being preferred). Into any one of these mixtures a clean bright plate of metal is immersed until it becomes coated with silver, gold or platina, as the case may be. A weak or dilute solution is recommended to commence with, and afterwards a stronger one. The acid need not be pure.

The second is a method of silvering metallic surfaces. Freshly precipitated chloride of silver is dissolved in hyposulphite of soda or any other liquid hyposulphite. Into this solution a clean bright plate of metal is immersed, and becomes very quickly coated with bright silver coating. To obtain thicker coats of metal, a galvanic battery is employed, using one of the liquids before described, and taking for one of the poles a piece of metal of the same kind as that intended to be precipitated.

The third is a method of ornamenting surfaces of brass or copper by first gilding them partially, according to some pattern, and then washing them over with a solution of chloride of platina, which gives a dead black appearance to the rest of the surface, and enhances the brilliancy of the parts gilt.

The fourth is a method of colouring polished surfaces of copper by exposing them to the vapour of sulphuretted hydrogen, or of any of the liquid hydrosulphurets, or to the vapours of sulphur, iodine, bromine, or chlorine, or by dipping the metal into liquids containing them.

The claim is to the use of gallic acid, or any liquid containing it, or any analogous vegetable substance for facilitating the precipitation of metals upon other metallic surfaces, and coating them therewith—to the use of hyposulphite of soda for the silvering of metals and the employing a galvanic battery for obtaining thicker deposits of silver, gold or platina, but only when used in conjunction with one of the liquids before described—and to the colouring of copper surfaces by exposing them to the chemical action of the above-named substances.

Josiah Taylor, of Birmingham, Brass Founder, *for improvements in the construction of lamps.*—Enrolment Office, June 9, 1842.

These improvements relate solely to lamps for burning wax, tallow, or other fatty matter. The improved construction consists in having a vessel to contain the substance to be burned, and a chamber beneath it, for holding hot water, or hot metal to liquidate that substance. As the hot water, or metal is only required to melt the tallow or other fatty substance in the first instance, the tube which supplies the inner part of the wick with air, is furnished with two projections at top, which turn into the flame, and by imparting heat down the tube, the tallow is kept for a continuance in a melted state. The hot water is to be poured in before lighting the lamp. When pieces of heated metal are used, the upper part of the lamp is to be taken off to admit of their being put in the proper place. Outside of the tube for supplying air to the interior of the flame is another tube, containing the wick, having several slits formed therein, through which the liquid tallow flows to the wick. There is also another and larger slit in this outer tube, for the purpose of raising the wick-holder, which is of the ordinary construction, having a projecting stud which moves up and down in the slit, and another stud which moves in a spiral round the air tube; so that when the tube is turned round, the wick or cotton rises or falls as desired. On the upper part of the tube are three projections, against which one of the arms of the frame of the glass shade comes, and when that frame is moved round, the tube will also be moved round, and thus raise or lower the wick.

The claim is to the mode of constructing lamps for burning tallow, or other fatty matters, or wax, by combining with a vessel to hold the tallow or other substance, a vessel to contain hot water or heated pieces of metal.

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[redacted]

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 985.] SATURDAY, JUNE 25, 1842. [Price 3*d.*

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

YOUNG AND DELCAMBRE'S TYPE-COMPOSING MACHINE.

Fig. 1.

The type-composing apparatus we are about to describe to our readers is similar in principle to that which was brought out about a year and a half ago, by the same parties, and excited at that time a considerable sensation; (see *Mec. Mag.* vol. xxxiv. p. 319) but so wonderfully simplified and improved in all its details as to be in effect quite a new machine. With a spirit and perseverance deserving of the highest praise, the patentees, Messrs. Young and Delcambre, have gone on surmounting difficulty after difficulty, till at length they have produced a machine which effectually accomplishes nearly all they had in view, while it is wholly free from that multifariousness and complexity, which were said, not untruly, to characterize their first attempts. The machine of itself will not set up types in a state fit for printing from, for that is not what the inventors ever proposed it should do; but it it will so facilitate the art of composition as to enable that to be done by the labour of females and children, which is now performed by the hands and heads of able-bodied men of good education, and done, too, a great deal quicker. Some things there may be to which it is not equal, with manual aid of any sort; as, for example, the setting up of pages in a number of different characters, as Roman, Italic, Greek, &c., or the setting up of algebraic calculations —but after so much has been already accomplished by it, we should be hardly warranted in considering these as more than a few remaining difficulties, which the mechanical genius of the country is sure ultimately to overcome.

The accompanying engravings represent the machine as it may be now daily seen at work at the premises of Messrs. Young and Delcambre, 110, Chancery-lane. Fig. 1 is a front view of it; fig. 2 a back view. It very much resembles in its general appearance a cottage piano, divested of its case. Like that instrument it has a set of keys, at which the compositor is seated, when about to compose, (instead of standing, as usual.) Of these keys there are as many as there are letters of the alphabet, and varieties of these letters likely to be required, with a due accompaniment of numerals, spaces, doubles, &c. Each key has one particular letter or character engraved upon it; and the keys are so arranged that the letters and characters most in request are placed at one side, where the compositor is seated, and those least wanted furthest off. Attached to these keys are an equal number of upright steel levers, A A, which are connected at top with a series of long brass channels, B B, filled with types, each of the sort corresponding with that marked on the key of the lever in connection with it. The office of the lever is to abstract from the channel above, one type every time it is acted on by the depression of the key; and to check the precipitating tendency of the types which might interfere prejudicially with the action of the lever, the channels are placed in a position considerably inclined, and the lever made to act sideways in detaching the lowest type of the column. Behind the channels, and at right angles with them, there is an inclined plane, C, which has a series of curved grooves, cut out in its surface, corresponding in number to that of the channels, and communicating with them—all leading to one general reservoir, or receiving spout, as it is called, at bottom, D, and all so nicely curved and graduated, in respect to one another, that work as fast as the compositor may, when a type is once liberated from its channel, and dispatched down one of these grooves, it is impossible (except from some accidental obstruction) for any subsequently liberated type to reach the goal before it.

So much being premised as to the general construction of the machine, let us now suppose that it is to be set to work. The first thing to be attended to is to see that the channels are all duly and proportionally filled. This is done by boys, who set a quantity of each letter up in wooden sticks, (a process exactly similar to that followed in type foundries) and transfer them from the sticks to the channels—the former part of which operation they do with astonishing rapidity. A machine in constant work will require the services of two boys for this purpose. The channels being filled, and the compositor seated at the instrument, she (for in the case of the machine exhibited it is a young lady who officiates,) begins with repeating on the keys the letters of the manuscript before her; and, as she depresses the keys one after another, she

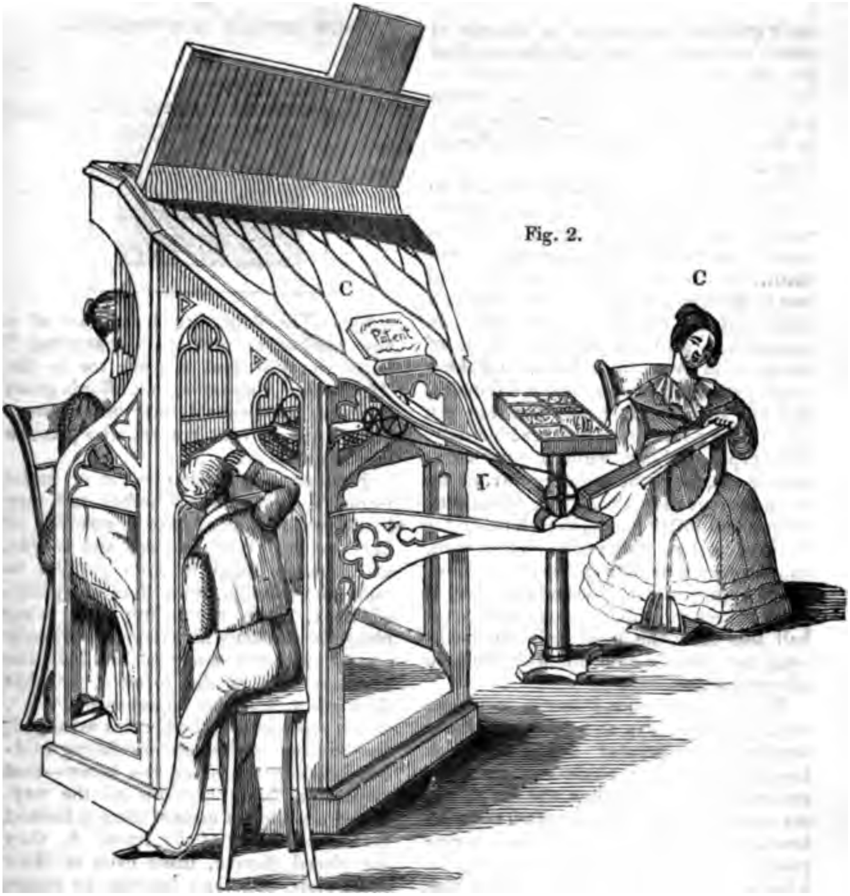


Fig. 2.

sends corresponding letters down to the receiving spout—the action of the levers on the columns of types being so adjusted that only one type can be detached at a time. The spout is curved downwards towards its termination for about 10 or 12 inches, and when the machine commences work, is filled with quadrats the whole length of such curve, which serve as a support for the letters to fall on, till a sufficient number of letters have accumulated to furnish an abutment for those which follow. Each type as it reaches the termination of the straight part of the spout is pressed forward by a small vibrating beater acted upon by an eccentric, which is put in motion by a small train of wheels driven by a boy (as shown in fig. 2.) From the spout the types are passed forward along a horizontal brass rail, E, to the justifying box F, where they are placed in lines, and spaced out, or, as it is technically called, justified, by an assistant composer. This justifying-box answers in every respect to the ordinary composing-stick, and is used with equal, if not greater facility. When the proper number of lines have been justified, they are taken out and placed in a galley, in the same way exactly as a composing stick is usually emptied. With the subsequent processes of imposing, or arranging the set-up matter in chases for printing from, the present invention does not interfere.

After types have been printed from, the present practice is for the compositor to *distribute* them, that is, return them to

their original repositories in the case at which he stands; but with the machine the task of distribution is performed by two boys, while two others, as before stated, are occupied in setting the types in lines with which they fill the different channels.

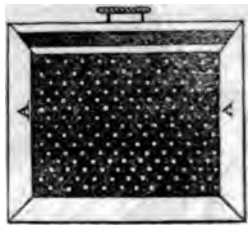
The number of persons required to work a machine is seven altogether; namely, one to play the keys, another to justify, a third to work the eccentric movement, two to supply the channels, and two to distribute; and it is herein at first sight that the machine suffers most in comparison with the ordinary mode of composition by a single hand. Of these seven persons, however, two are females, and five very young boys; and they can set up, after three months' practice only, 6000 types an hour, while a good compositor cannot in the ordinary way, set up on an average more than 1700. The seven female and infant hands, therefore, do the work of at least three able-bodied men, and in consequence of requiring less wages, the average cost per thousand (brevier) is only twopence, which is at least one-half less than the most ordinary book-work can now be done for with the help of apprentices.

But when the young women employed in playing the keys and justifying, have acquired the greater dexterity which length of practice alone can give, we make no doubt that they will be able to set a great many more than 6000 types an hour. The labour, too, of the boy employed in working the eccentric may be wholly saved; for he does nothing which might not be equally well performed by a pedal movement, acted on by the person who plays the keys, (after the manner of the old spinning-wheel,) or by connecting the eccentric movement by means of a band, to the steam engine (where one is employed to work the press, as is now so usually the case).

The maker of the machine now exhibiting in Chancery-lane, is Mr. J. G. Wilson, of Clerkenwell, and to the assistance which the patentees have derived from his skill and ingenuity, much of the perfection at which they have rerecently arrived is, we understand, owing. The cost of a machine is about 100*l*., in addition to which the patentees propose to charge a small sum annually for licence to use it.

NEW METHOD OF ENGRAVING.

B



Sir,—The following description of a new method or process in engraving, I hope you will find a place for in the *Mechanics' Magazine*, as it affords great facilities, and probably may become useful to some of your readers who practise this beautiful art.

First provide a square wood or metal frame (see fig.) about 7 inches each way in dimensions; next take a quantity of fine needles, all of one size and *height*, and arrange them in rows parallel to each other, similar to the lines of a printed book, each succeeding line being placed in contact with the one previously set up, and alternately pushed half the diameter of a needle forward, so that they will present this appearance ·.·.·.·. which represents eight needles arranged, the first one in the top line falling midway between the other two below—that disposition being kept up all the way. When a sufficient mass of them is formed to fill the cavity of the frame A, they are placed therein, made even at their sharp ends, and then fastened by means of the screw B turned by means of a milled head. When all this is accomplished, a flat and polished plate of copper, or steel, previously covered with engraver's "ground," is laid on the pointed surface of the mass of needles, and carefully pressed thereon by means of a screw, or other power. It will be found on inspection that the ground will be cut through, and the copper exposed at every point the needles have touched, provided the process has been properly conducted. The effect is now put in by corroding the plate with a mixture of nitric acid and water, stopping out the lights, &c., with varnish in the usual manner, so as to produce the required depth of tone. A second (but indiscriminate) application of the mass of needles to the plate previously to its being etched, is also a great

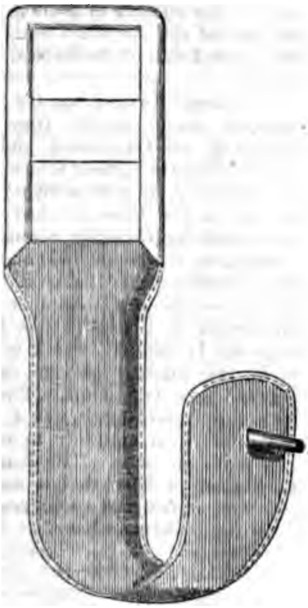
improvement, as it destroys, in a great measure, the palpable directions of the dots in lines across the plate.

You can thus have a first-rate stippled engraving executed in even less time than would be required to complete a common aquatint one.

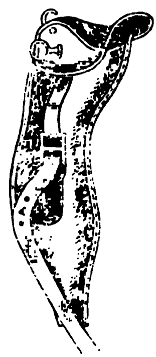
I am, Sir, respectfully yours,

M. Newsam.

IMPROVED HARNESS BACKBAND TUG—INVENTED BY MESSRS. INSOLE AND JONES, BIRMINGHAM.



A



(Registered pursuant to Act of Parliament.)

The peculiarity of this improved Harness Backband Tug consists in the desired fastening being effected without any buckle and without lapping the bellyband round the shaft; the advantage of which is, that a horse may be put into the shafts in one-fourth the usual time, and with ten times the facility. The new mode of fastening will be at once understood from an inspection of the accompanying figures. The pivot A, when inserted in the hole of the strap, makes all perfectly tight and safe. The alteration is very simple, but one of great and obvious utility.

NEW ELECTROTYPE PROCESS FOR COPYING ENGRAVINGS.

Sir,—Allow me the favour of informing your readers of an electrotype process, which I believe to be quite new. The method of proceeding is as follows:—Transfer, by pressure, a newly-printed impression of a steel engraving, woodcut, or lithograph, to a polished copper-plate, previously cleaned by immersion in very dilute nitric acid; then connect it by means of a wire with the *positive* plate of a constant voltaic battery, while to a similar wire, proceeding from the *negative* element, a piece of pure gold is affixed. Both the "poles" are to be immersed in a trough or earthen vessel, containing a solution of oxide of gold in cyanide of potassium. After about half a minute the copper-plate should be removed, when it will be found to be finely gilded, a film of gold being deposited

thereon by galvanic agency. Having proceeded thus far, the ink should be washed off the plate with oil of turpentine, when the unaltered copper below will be exposed to view. A border of wax must then be put round the plate, and pure dilute nitric acid poured thereon and allowed to corrode the copper to the required depth; as that liquid has no chemical action whatever on the film of deposited gold, an etching is produced, exactly resembling the plate from which the original impression was taken.

With my best wishes for the success of your interesting and useful periodical, I beg to subscribe myself your obedient servant,

T. W. N.

Newcastle, June 15, 1842.

MESSRS. SEAWARD AND CO.'S ATMOSPHERIC MARINE ENGINE.

On Friday, the 17th inst., a trial was made on the Thames of a new iron steamer, built by Messrs. Ditchburn and Mare, and fitted up with an engine on a new plan, by Messrs. Seaward and Co. The vessel is 150 feet long, with only 19 feet beam, and her draught of water is no more than 4 ft. 8 in. The engine is on the atmospheric principle, and the first of the sort, we believe, ever applied to marine purposes. It consists of three cylinders, of 47 inches diameter, placed in a line athwart the vessel; and the pistons, which have three feet stroke, are worked by the alternate action of the atmosphere and steam, above and below. The three piston rods are connected by oscillating rods directly to cranks at different angles, so that two at least are always in action, whereby the inequality of application when two only are employed, is avoided. The pistons themselves are of a peculiar construction; and on this the working efficiency of the engine seems mainly to depend. Each piston has three grooves on its outer circumference; of which the upper and lower are for the reception of the packing, and the middle one is kept filled with steam, by the means to be presently explained. The piston has three guide rods, one of which is hollow; and within this hollow guide-rod there is a tube, which works through a stuffing-box, and communicates at the opposite end with the boiler. Steam is constantly supplied through this tube to the middle groove of the piston, as well during its ascent as descent, *and any access of air to the cylinder is thus completely prevented*, the pressure of the steam while working being at all times greater than the pressure of the atmosphere. During the trial last week, the pressure of the steam was generally about 8 lbs. The engine is estimated to be of 100 horse-power.

The paddle-wheels are 16 feet in diameter; the number of floats in each 24; the area of the starboard floats 9 ft. 6 × 14 in.; and that of the larbord 9 ft. 4 × 14 in.

The vessel (which has not yet been named) made several trips between Blackwall and Gravesend, and the engines worked throughout admirably, making generally 33 or 34 strokes a minute. In one of the trips she had a trial of speed with the *Railway*, commonly supposed to be the fastest boat on the river, from Greenhithe to Blackwall, and beat her by two minutes. Another trip from Gravesend to Blackwall was made in 1 hour and 7½ minutes, which is supposed to be the quickest passage ever made between these two points. The tide was with the vessel, but it was a low neap tide, not equal certainly to more than two miles an hour. The distance from Gravesend to Blackwall is stated to be 22 miles, so that the speed realized was close on 20 miles an hour.

THE INFANT PRINCE—HUNT'S PROPELLING AND STEERING APPARATUS.

The performances of this little steamer, which may be seen almost every day experimenting on the river, are continuing to attract a good deal of public attention. The rapidity of her movements, albeit neither paddles nor stern propellers are to be seen, and the singular facility with which she turns round in an instant, within little more than her own length, are deservedly admired. We have before repeatedly explained to our readers in what the peculiarity of Mr. Hunt's apparatus consists (*Mech. Mag.* No. 890 and 982,)—in its serving at once to steer and to propel the vessel; and shall only here remark, that whatever may be the danger to be apprehended at sea, from the breaking of any part of the toothed gearing by which the power is communicated

he engines to the rudder-propeller, an objection which can be of but litce in rivers or canals, where any acof that sort can always be speedily ed; while for the navigation of narıters, a vessel provided with this rudopeller, combines the advantage como all stern propellers of causing no ıt the sides, with the more peculiar one ıg able to run into creeks, wharfs, and anding places, with a much less offing ny other steamer differently equipped. *fant Prince* is worked by a pair of ting engines, manufactured by Messrs. and Son, of 12 horse power, and at ertainly high) pressure of 35 pounds.

AMBRIAN ENGINE AND BLAXLAND'S PROPELLER.

—The particulars which I forwarded to nd on which you grounded your notice *Jane* on the river Lea, in the *Me-'s' Magazine* of the 4th inst., were taken from the number of the *Hert-Reformer*, mentioned by your corresnt "S."

absence of all mention in my particuf "Mr. Crosley, the patentee of the ambrian engine," or as the *Reformer* ıs very correctly describes him, "an ıt engineer"—of the new Cambrian itself, and of Mr. Crosley's *own* *it* of it—arises, first, from the circum- "that the article of which the said forms the postscript is concerning Mr. nd's propeller, and not the new Camengine or of the 'eminent engineer;'" lly, from the circumstance "that the ability of the Cambrian engine to and river navigation, from the direct of its action, was (not) brought alıs prominently under the notice of the men present as the merits of the Blaxıropeller itself," for no Cambrian enas there experimented upon or even ted.

other gentlemen present at the meeting rith equal justice complain to you (by y?) that their names have not been erred from the columns of the *Reformer* se of your journal, I here beg leave to n them—Mr. John J. Gripper, Mr. r Gripper, Mr. Y. Crowly, of Hertand Mr. Marchant, clerk to the trus-

ave no desire to impugn the advantages *tever they may be*—*of* the Cambrian engine over that of Boulton and Watt. I know nothing whatever concerning it; but this I must be permitted to say, that Mr. Crosley is the first "eminent engineer" who has proposed to attach a sub-marine propeller to the engine-shaft direct.

You will here see that not one name alone has been "studiously omitted," and where "the small manœuvre" is to rest, I call upon more than "one of the public" to determine.

I am, Sir, yours, &c.,

C.

WALKER'S WATER ELEVATOR—THE CHALLENGE ANSWERED.

Sir,—What I wished to submit for consideration, was, that the centrifugal pump is exempt from certain disadvantageous drawbacks, from which Mr. Walker's is not altogether exempt; such as,—there being an uniform and continuous motion, both of water and machinery, in the case of the centrifugal pump, instead of a rapid discontinuous or reversing motion—Mr. Walker's pump having also various pieces of machinery beyond what the centrifugal pump requires; and in mentioning these, I did not intend to convey any idea of there being an "*outrageous weight*" in his machine—inferring merely, that the extra parts must produce some slight friction, and cost and weigh something, at least. As to "T. Y.," he has merely misread my words; I stated that with the *same sized pipe* more water would be raised; but, naturally, by *proportionate power*.

Now it was a very natural subject for consideration, whether the above circumstances would not practically effect the relative worth of the machines; but Mr. Walker seems to decline reasoning, on the ground that I have "*miscalculated, misrepresented*, and *know nothing about*" his invention. It is very easy to assert all this; but I am not aware of any misrepresentation, and should have been glad if he had stated the *where* and *how*.

The mode of my calculation was to estimate, according to the laws of inertia, the amount which the water would advance, in each pipe, every stroke, on account of the joint effect of the upward velocity imparted to the water by the maximum velocity of the pipe in its up-stroke, and the receding of the pipe itself during its down stroke, while the water is yet moving upwards, (or, in case of a slower motion of the pipe, before the water has acquired an equal velocity downwards again). It may be that I rather over-estimated the requisite diameter of the main pipes, by not taking into account the effect of their trumpet shape.

The above appears to me to be the most

natural and simple view of its action, but if I am in error, and "*know nothing about it*," I shall be much obliged, and perhaps it would also be for the benefit of other readers, if Mr. Walker would set me right. If he considers a knowledge of the rationale of its action useless, it would at least be satisfactory to know, for the sake of ready comparison with the centrifugal or any other pump, what *weight of water is raised a certain height*, by the expenditure of a certain amount of power, measured in *pounds raised a given height*. If this can be ascertained, it would be more satisfactory than measuring the effect by a man's power, which I suspect may easily vary from 10 to 20 per cent.

According to the best of my understanding, a well-constructed centrifugal pump might raise an amount of water equivalent to 95 per cent. of the whole power employed; but not having had the opportunity of proving this, I should not prematurely condemn Mr. Walker's invention if it does not perform quite so much. I am sorry, that from want of leisure, and the nature of my occupations, at the present time, I am unable to comply with Mr. Walker's very fair challenge; but it might to some intent answer the same purpose with the scientific and practical, if Mr. Walker would afford the information above pointed out, or state what per-centage of the power expended is effective in raising its equivalent of water.

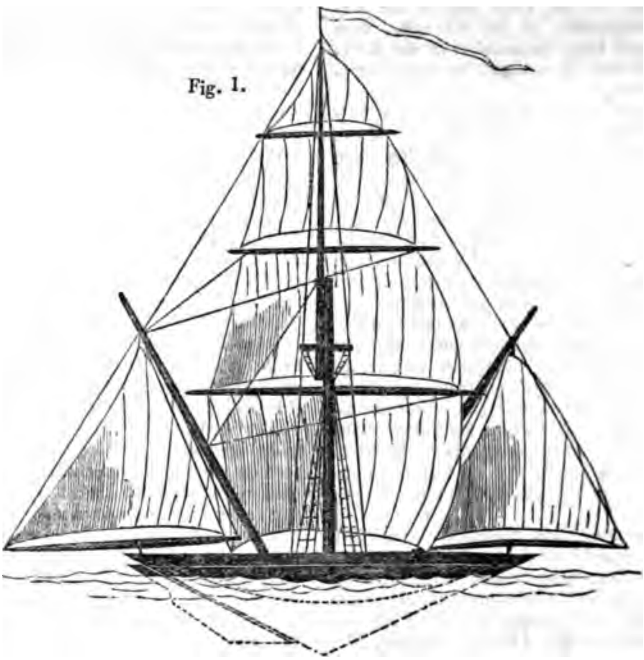
Yours respectfully,

W. P.

P.S. I would observe to "T. Y.," who says he does not know how the centrifugal pump referred to acts, that it is, in construction and use, exactly the *converse* of Messrs. Whitelaw and Stirrat's patent engine, (which obtains power from the descent of water, instead of expending power for raising water); an engine which was praised in the *Mechanics' Magazine* for its cheapness, lightness, and especially for yielding practically a larger per-centage of mechanical effect, from a fall of water, than any other contrivance in common use.

DEMPSTER'S SYSTEM OF BUILDING AND RIGGING VESSELS.

Fig. 1.



[Mr. Henry Dempster, the inventor of this system, is a native of Kinghorn, and free mariner of the East *India Company's* Service. In February last he exhibited a small model of a boat built and rigged on his plan before the Scottish Society of Arts, who appointed a Committee to report on its utility. Before making any report to the Society, however, the Committee have suggested, that a boat, sufficiently

›r them to experiment with should be built, subscription has accordingly been entered r the purpose, in shares of 1*l*. each— ›sel to be the property of the subscribers. stem of Mr. Dempster is ingenious and le. We sincerely hope, therefore, that the ption will be speedily filled up, and that formances of the experimental vessel may p to the inventor's anticipations, in which e will hardly fail to be well rewarded time and trouble he appears to have bestow› his invention. From the description of it follows, and which is from the pen of the ›r himself, it will be seen that it divides itself o parts—the first relating to the build of the –the second to the rigging, and that either adopted quite independently of the other.— M.]

1. *New Form of Hull.*

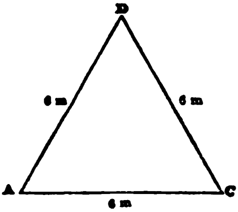
e advantages of the new form of hull ı in fig. 1, are these: First, The ›ility of building a vessel so formed, ularly strong at the bottom. Iron be the best material for construc- as it would answer the threefold se of being strong, weighty, and leave sufficient capacity for the re- ite ballast which should be placed When the ballast is all fitted for the tion of the vessel's bottom, a deck be laid over it, and so securely :d, that, in the event of leaking be- he water would not flow up.

ondly, A vessel so formed would ›s liable to damage herself in the of striking a rock or any other hard ›nce, as the shock would be less ı than that of a vessel with a per- :ular stem, and, unless she was to exactly on the point, the chances be in her favour for again coming 'etting aground on a sand-bank she not bump so heavily as a vessel a long keel, whilst there would be langer of her breaking her back.

ırdly, The sailing qualities of such ned vessel will be good, and her rty for quick turning unequalled, as he rudder and sails can be made at :o act in bringing her round.

r weatherly qualities, I have no , will be good. It is my opinion with a six-knot breeze upon a wind, : the water was smooth, and no cur- she would make an equilateral tri- ar course; that is to say, if she were six miles on one tack, and six miles ; other, she would go six miles to ›ard.

As, for example, suppose the wind to be blowing from A towards C in the diagram. The vessel starts at C on the larboard tack, and sails six miles, when she will fetch D. About ship, and sail six miles on the starboard tack, when she will fetch A; the vessel will then have gone from C to A, six miles dead to windward.



My reason for supposing she would be so weatherly are these: When the wind was blowing sufficiently strong, so as to make such a formed vessel careen over, the more she careened, the more length and body of the vessel would be immersed in the fluid to leeward, whilst the contrary would be the case to windward; so that the greater pressure of the fluid on the lee side of the vessel, and acting upon a little weather helm, would, in my opinion, have a tendency to press her to windward of the course she was going; and as the sails of the rig incline remarkably close to the wind, they, of course, will be of assistance in bringing out my hypothesis.

With respect to the stability of such a vessel, I think there can be no question; because the ballast lying low, and the vessel having a good beam, sail may be carried on until every mast went by the board.

The action of the wind, also, upon the weather quarter of such a formed vessel, whilst beating to windward, would have no bad effect; the action of the wind upon a square-sterned vessel retards her progress.

In building a vessel upon this principle, intended to possess the combined advantages of speed, weatherly qualities, stability, and to be capable of performing rapid evolutions, it is required that she must be constructed upon the strictest mathematical calculations; that is to say, the exact dimensions of that portion of her bottom which is intended for the ballast to lie and hold her to wind-

ward, must be nicely determined, so as to show as little resistance to the fluid as possible; whilst, at the same time, it must be exceedingly strong.

It is my opinion that no more body of a vessel (intended for fast-sailing weatherly qualities) ought to be immersed in the fluid than what is actually necessary to secure her stability, and keep her to windward; as it stands to reason that all long vessels must drag a certain portion of the fluid along with them, which tends a little to retard their velocity. But it must also be remembered, that if there is one square foot less of resisting surface exposed to the fluid than what is necessary to keep to windward, it would be equally as bad, because upon a wind the vessel would fall to leeward.

The only disadvantages of the hull upon the new construction is, great draft of water, and unfitness for grounding in a tideway where it is hard, as she would lay over at a considerable angle. Were she to ground where the bottom was soft, the last mentioned disadvantage would be overcome.

Were a vessel of this plan to be built upon a slip, a cradle for launching her in could easily be constructed. Were she to be built in a dry dock, the water, of course, would just be allowed to flow in, and she would float out; and in the event of her requiring repairs, the necessary precaution would also be taken to have the ways suitable for the purpose.

II. *New Rig.*

The advantages of the new rig are power, safety, and handiness, having a decided superiority for expeditious working, and being capable of manœuvring a vessel through more evolutions with greater exactness than any other rig that ever preceded it.

The fore and aft equilateral sails being set, a vessel is always under government when there is wind, and will never miss stays if properly managed; as the sails have an equal advantage of propelling and manœuvring astern as they have ahead.

The principle upon which these sails are worked is simply this; there are yards fixed at the middle in swivels on each stem-head, those yards are kept from topping either way by lifts that are made fast to other swivels at the mast-heads.

The sheets of the sails are hauled out *with travellers* round the yards.

The sails are hoisted up by a single tie, that reeves through the swivel at the mast-head, so that, in case the yards should be turned round and round, the tie is always kept clear. When these sails are set tight, there is an equal strain on both leech ropes, and, as the greatest body of the canvass is low, the principal strain comes on the swivels at the stem-heads and the lower yards that spread them.

The fore and after masts can be secured with shrouds on each side, and stays from the main and main-top mast head. The lower lifts will be sufficient support to prevent the masts from bending upwards.

The main-mast may be rigged, and sails made to be worked on it, as on board of any other square rigged-vessel; but what I would recommend for small craft is, that the top-gallant and royal mast (which will be one spar,) go sliding gunter fashion abaft the main and main-top mast, which is also one spar.

When the top-gallant mast is struck, its heel may be stepped on deck, so that, when its backstays are set up, it will be no burden upon the main mast, but rather a support.

The square sails on the main-mast have the advantage of receiving the full strength of the breeze from all points; there being no eddy winds to affect them either from fore or mizen topsails. Sailing off the wind, studding sails may be set from all the yards as required.

The safety of the foregoing rig in tacking, wearing, or boxhauling, is unequalled. There is no danger apprehended as there is in that of a main-boom jibbing; there is little danger of splitting sails, as jibs are so liable to do.

The fore and aft equilateral sails go round on their centre: they are easily worked, reduced, or taken in.

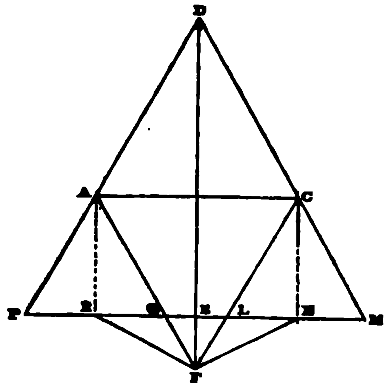
From the sails being equally balanced over the vessel, she is not so liable to pitch heavily as rigs where the greater quantity of canvass is before the centre of gravity.

A vessel properly adapted for this rig ought to be sufficiently large, so as to admit of the lower yards working clear of the heads of those standing on deck.

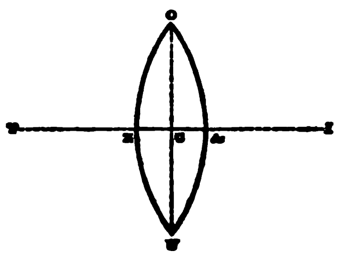
I may also remark, that, in performing any of the evolutions above specified, there is no necessity to swing the lower yards round, unless the person who is work-

ing them thinks proper, as the principal advantage of these sails is the easy manner which they are worked, by merely sluing the yards from side to side.

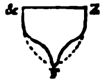
Geometrical Demonstration how to find the Principal Outlines by which to build, mast, and rig a Vessel, as shown in fig. 1.



The length of hull A C. Upon A C construct the equilateral triangle, A D C and A F C on the opposite side of the line. Join D F. Draw C E and A R parallel to D F. Make the angles C F E, A F R, equal to D F A, D F C. Produce D C, D A. Through the angles of meeting R and E, draw the line PROBLEM, and it is finished. Then will ROBLE represent the length of hull, B F will be the depth, F E, F R the stem and stern posts, F O A, F L C the fore and after masts. F B D the main mast. P R O, L E M, is the length of the fore and after yards. Twice C E M or A R P are the fore and after sails. A C will be the length of main stays, and A D, C D the main-top-gallant stays.



Draw O U the length of hull, which bisect at C with the line Z & produced on both sides. With ⅜th the length of hull in your compasses, place one foot in U and the other in I, and describe the arch U O; and, with *the same distance in your compasses,* place one foot in O and the other in T, and describe the arch O U, which will form the deck, Z & being the breadth of beam.



With the breadth of beam, & Z, in your compasses, describe the arcs Z, F, and F, F; being the point perpendicular with the centre of gravity, and where the midship section is securely fastened.

PATENT LAW CASES.

Crane v. Price, and others.

[We gave very briefly in our last Number the substance of the judgment in this important case; but have since been favoured by the plaintiff with the following literal copy of the shorthand-writer's notes.]

Judgment.

The Lord Chief Justice Tindall:—This was an action on the case for the infringement of a patent granted to the plaintiff on the 28th of September, 1836, for an improvement in the manufacture of iron. The declaration was in the usual form, and the defendants pleaded thereto, first, that they were not guilty; secondly, that the plaintiff was not the first and true inventor of the said improvement — upon each of which pleas issue was joined;—thirdly, after setting out at length the plaintiff's specification, the defendants pleaded that the alleged improvement therein described was not a new manufacture invented by the plaintiff within the intent and meaning of the statute, as to the public use and exercise thereof in England; which allegation was traversed by the plaintiff in his replication; fourthly, the defendant pleaded that the nature of the plaintiff's invention, and the manner in which it was to be performed, was not particularly described or ascertained by the plaintiff in his specification—upon which plea issue was joined;—and in their last plea, the defendants, after referring to the plaintiff's specification before set out in the third plea, stated the grant of letters patent, dated the 11th of September, 1828, to one James Beaumont Neilson, for an improved application of air to produce heat in fires, forges and furnaces, where bellows and other blowing apparatus were required—that Neilson's invention was the production and application of a hot-air blast, and was in public use with Neilson's licence in the smelting and manufacturing of iron from iron-stone, and was the hot-air blast in the plaintiff's specification mentioned—that the plaintiff could not use the hot-air blast mentioned in his specification without Neilson's licence, and that he had obtained such licence before the grant of his letters patent, and that the

using, by the plaintiff, of the hot-air blast in the smelting of iron from iron-stone, combined with anthracite or stone-coal, as mentioned in his specification, was a using and imitating of Neilson's invention, whereby the plaintiff's patent was void. The plaintiff replied to this last plea that Neilson's invention was not the same hot-air blast; and that the machinery and apparatus adapted for the application thereof, mentioned and referred to in the plaintiff's specification, was not, nor was the using by the plaintiff of the invention, as described in his specification, a using and imitating of Neilson's invention, described in Neilson's specification; which allegation is traversed by the defendants in their rejoinder. At the trial before me, a verdict was entered for the plaintiff on all the issues, subject to the opinion of the Court, upon the evidence given at the trial, as contained in a report agreed upon between the parties, the Court being at liberty to draw the same inference from it as a jury might draw. On the argument it was contended by the defendants, that the verdict ought to be entered for them on each of the issues joined on the record; but as the main question between the parties turns on the third issue, which involves the question whether the invention of the plaintiff is a manufacture within the intent and meaning of the statute of James, that is, whether it is or is not the subject matter of a patent; and as the determination of this issue in favour of the one party or the other will render the decision of the other issues free from difficulty, the simplest way will be to apply ourselves in the first instance to that question. Now in order to determine whether the improvement described in the patent is, or is not a manufacture within the statute, we must, in the first place, ascertain precisely what is the invention claimed by the plaintiff, and then by the application of some principles admitted and acknowledged in the application of the law relating to patents, and by the authority of decided cases, determine the question in dispute between the parties. The plaintiff describes the object of his invention to be the application of anthracite, or stone-coal, combined with hot-air blast, in the smelting or manufacture of iron from iron-stone, mine, or ore, and states distinctly and unequivocally at the end of his specification that he does not claim the use of a hot-air blast separately as of his invention, when uncombined with the application of anthracite or stone-coal; nor does he claim the application of anthracite or stone-coal, when uncombined with the using of hot-air blast; but that what he claims as his invention, is the application of anthracite, or stone-coal *and culm, combined* with the using of hot-*air blast, in the* smelting and manufacture of iron from iron-stone, mine, or ore. And the question, therefore, becomes this, whether admitting the using of the hot-air blast to have been known before in the manufacture of iron with bituminous coal, and the use of anthracite and stone-coal to have been known before in the manufacture of iron with cold-blast; but that the combination of the two together (the hot-blast and the anthracite) were not known to be combined before in the manufacture of iron, whether such combination can be the subject of a patent. We are of opinion that if the result produced by such a combination is either a new article, or a better article, or a cheaper article to the public than that produced before by the old method, that such combination is an invention or manufacture intended by the statute, and may well become the subject of a patent. Such an assumed state of facts falls clearly within the principle exemplified by Abbot, Chief Justice, in the case of The King *v* Wheeler, 2d Barnewall and Adolphus, 349, where he is determining what is, or what is not the subject of a patent, namely, it may perhaps extend to a new proces to be carried on by known implements or elements acting upon known substances, and ultimately producing some other known substance, but producing it in a cheaper or more expeditious manner, or a better or more useful kind; and it falls, also, within the doctrine laid down by Lord Eldon, in Hill *v.* Thompson, in 3rd Merivale, 629, namely, there may be a valid patent for a known combination of materials previously in use, for the same purpose or even for a new method of applying such materials; but the specification must clearly express that it is in respect of such new combination or application. There are numerous instances of patents which have been granted, where the invention consisted in no more than in the use of things already known, and acting with them in a manner already known, and producing effects already known; but producing those effects so as to be more economically or beneficially enjoyed by the public. It will be sufficient to refer to a few instances, some of which patents have failed on other grounds, but none on the ground that the invention itself was not the subject of a patent. We may first instance Hall's patent for applying the flame of gas to singe off the superfluous fibres of lace, where a flame of oil had been used before for that same purpose; Derosne's patent, in which the invention consisted in filtering the syrup of sugar through a filter, to act with animal charcoal, and charcoal from bituminous schistus, where charcoal had been used before in the filtering of almost every other liquor except the syrup of sugar; Hill's patent in 3d Merivale above referred to, for improvements in

elting and working of iron, there the on consisted only in the use and ap- n of the slags or cinders thrown off operation of smelting, which had reviously considered useless for the tion of good and serviceable metal admixture of mine rubbish; again, 's patent was taken out for improve- in dressing woollen cloth, where the on consisted in immersing a roll of manufactured in the usual manner, t water.—See The King v Daniel, in odson's book on patents, 274. The uestion, therefore, that ought to be ered on the evidence is, was the iron ed by the combination of the hot- d the anthracite a better or a cheaper than was produced from the combi- of the hot-blast and the bituminous and was the combination described in cification new, as to the public use f in England? And upon the first upon looking at the evidence in the we think there is no doubt that the of the combination of the hot-blast he anthracite, on the yield of the fur- was more, the nature, properties, and of the iron, better, and the expense king the iron less, than it was under mer process, by means of the combi- of the hot-blast with the bituminous It is to be observed, that no evidence oduced on the part of the defendants et that given by the plaintiff on these ls, and that it was a necessary conse- , from the proof in the cause, that bstitution of the anthracite coal, in or in part, instead of, or in the place uminous coal, from the substitution of he manufacture of the iron should be ed at less expense. It was objected, course of the argument, that the or degree of invention was so small, could not become the subject-matter atent;—that a person who could pro- license to use the hot-air blast under n's patent, had a full right to apply last to coal of any nature whatever, er bituminous or stone coal. But we if it were necessary to consider the la- pains, and expense incurred by the iff, in bringing his discovery to per- , that there is evidence in this cause he expense was considerable, and the ments numerous. But in point of law, bour of thought or experiments, and penditure of money, are not the essen- rounds of consideration on which the on—whether the invention is or is not bject-matter of a patent? ought to d; for if the invention be new and to the public, it is not material whe- be the result of long experiments and nd research, or whether by some sudden and lucky thought, or mere accidental discovery. The Case of Monopolies, 11th Coke, states the law to be, that where a man, by his own charge or industry, or by his own wit or invention, brings a new trade into the realm, or any engine tending to the furtherance of a trade, that never was used before, and that was for the good of the realm, that the King may grant him the monopoly of a patent for a reasonable time. If the combination now under consideration be, as we think it is, a manufacture within the statute of James the First, there was abundant evidence in the cause, that it had been the great object and desideratum, before the granting of the patent, to smelt iron-stone, by the means of anthracite coal, and that it had never been done before: there is no evidence on the part of the defendants to meet that which the plaintiff brought forward. These considerations, therefore, enable us to direct that the verdict ought to be entered for the plaintiff, on the third issue; that it was a new manufacture—new as to the public use and exercise thereof within England and Wales. On the same ground, also, the second issue is disposed of in favour of the plaintiff: no evidence was produced on the part of the defendant to show any inventor earlier than the plaintiff; nor does the fact that there was an earlier inventor appear from the cross-examination of the plaintiff's witnesses. As to the first issue, namely, whether the defendants had infringed the patent, we think it clearly appears on the evidence, that the defendants had used, either in part or in whole, the combination described in the specification of the plaintiff's patent; the plaintiff's evidence goes fully to show certain infringements, and that is not met by any explanation on the part of the defendants. Indeed, the defendants' case did not appear to rest on this point at the trial so much as on the important question raised by them, whether the improvement described in the specification was a manufacture within the statute of James? Upon the fourth issue, which raised no more than the usual inquiry—whether the nature of the invention was sufficiently described in the specification—the usual evidence was given, that persons of competent skill and experience could, by following the direction, produce the manufacture described, with success, and this evidence was entirely unopposed; upon this issue, also, the verdict ought to be entered for the plaintiff. With respect, however, to the issue raised in the rejoinder in the plaintiff's replication to the fifth plea, we are of opinion, that taking the whole evidence brought forward by the plaintiff, it is impossible to perceive any substantial or real distinction between the hot-air blast, and the machinery and apparatus described

in Neilson's specification, from that described or referred to in the plaintiff's; or to say that the using by the plaintiff of the invention described in his specification was any other than a using and imitating of the invention described in Neilson's specification. The plaintiff, indeed, worked by licence under Neilson's patent at the time of his discovery: on this fifth issue, therefore, we think the verdict should be entered for the defendants. Then arises the question—whether the plaintiff is or is not entitled to the judgment, notwithstanding the verdict on the fifth issue; on which point the argument on the part of the defendants is, that the taking out a patent for an invention, which invention cannot be used or enjoyed by the public, except by means of the former invention of another person, which former invention is itself the subject-matter of a patent still in force, is void by law. Undoubtedly if the second patent claims, as part of the invention described in it, that which had been the subject-matter of a patent then in force, it would be void, on the double ground that it claimed that which was not new (which, indeed, would equally be the case if the former patent had expired): and also that it would be an infringement of, and inconsistent with, a former grant of the king still in force, which latter consideration alone would make a new grant void. But in this case there is an express disclaimer of any part of the invention to the use of the hot-air blast, which was covered by Neilson's patent, the specification describing that the application of the hot-air blast was well understood, and extensively applied, in many places where ordinary fuel is employed. The validity, therefore, of the plaintiff's patent cannot be impeached on either of the grounds above adverted to. Unless, therefore, the grantee of the new letters-patent is bound by law to specify whether such former invention which is excepted, was so excepted on the ground of its being generally known and used by the public, and on the ground that it was the subject of a patent, that secured the use of it to a former patentee, the new patent will be good; but that distinction is as much in the knowledge of the public as the grantee of the patent. If, indeed, the new patent had been taken out for improvement or alterations in an invention secured by a former patent, then for obvious reasons greater particularity would be necessary to distinguish the new from the old. But the present specification expressly says—"I take the whole of the invention, already well known to the public, and I combine it with something else." Now, it is further argued, that in point of law no patent can be taken out which includes the subject-matter of a patent still running or in force. No authority was cited to support this proposition; and the case which was before Lord Tenterden, and in which he held that where an action was brought for improvements in a former patent granted to another person, and still in force, that the plaintiff must produce the former patent and specification, *that* at least affords a strong inference that the second patent was good; *Lewis* v. *Davis*, 3d Carrington, and *Payne* and *Harmer* v. *Payne*, 11th East, are clear authorities on the same point; and upon reason and principle there appears to be no objection. The new patent, after the expiration of the old one, will be free from every objection; and whilst the former exists, he new patent can be legally used by the public, by procuring a licence from Neilson, or by purchasing the apparatus from him or some of his agents; and the probability of the refusal of a licence to any one applying for it is so extremely remote, that it cannot enter into consideration as a ground of legal objection. On the whole, therefore, we think the verdict is to be entered for the plaintiff on all the issues except the fifth; that the verdict is to be entered for the defendants on the fifth issue; but that, notwithstanding such verdict, the judgment must be given for the plaintiff.

Court of Queen's Bench.

Westminster, June 16, 17.

(*Before Lord Chief Justice Denman and a Special Jury.*)

The Queen v. *Walton.*

This was a *scire facias* to repeal a patent which the defendant had taken out in 1834 for the application of India rubber to the manufacture of flexible cards for the carding of cotton and other fine wool.

The Solicitor General (with whom were *Mr. Thesiger*, *Mr. R. V. Richards*, *Mr. Cowling*, and *Mr. Cardwell*) appeared upon the part of the Crown, and stated that the alleged invention of Mr. Walton was known as early as the years 1825 and 1826, in the latter of which years Mr. Faraday gave a full explanation of it in a discourse addressed to the Royal Institution, which was afterwards printed in the *Journal of Science and Art* in the same year. The case of the defendant is, that the proportions of the combination for which he has taken out his patent, as well as the result, efficacy, and utility of the composition, are such as to entitle it to the character of a totally new invention.

Sir T. Wilde, *Mr. Sergeant Bompas*, and *Mr. Addison* appeared for the defence.

A great number of witnesses were called—the case occupying the Court two entire days—after which the Jury found a verdict for the Crown, thereby annulling the patent.

PIRACY OF DESIGNS.

At a Petty Sessions held at Patrington, on the 21st of May last, by Mr. Sykes, and another magistrate, Messrs. R. and F. Cassby, proprietors of an improved form of plough, registered, January 14, 1841, No. 530, made a complaint against John Westerdale Owthorne, of Holderness, for a piratical imitation of their invention. The magistrates, after hearing evidence and examining the provisions of the Act of Parliament on the subject, found the charge proved, and fined the defendant five pounds with two pounds costs.

LIST OF DESIGNS REGISTERED BETWEEN MAY 27TH, AND JUNE 22ND, 1842.

Date of Registration. 1842.		Number in the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
May	27	1255	S. W. Smith	Wheel	3 years
"	"	1256,7	Talbot and Sons	Carpet	1
"	"	1258	Robert Yeates	Leeching and Cupping Instrument	3
"	"	1259,64	H. and J. Dixon	Carpet	1
"	"	1265	Southwell and Co.	Ditto	1
"	30	1266	James Edwards	Sauce boat, earthenware or china	1
"	"	1267	Ditto	Tureen	1
"	"	1268	Ditto	Vegetable Dish	1
"	"	1269	Benjamin Nickels	Button	3
"	"	1270,3	Ditto	India Rubber	1
"	"	1274	Perry and Sons	Metal Jug	3
"	31	1275	Walton and Co.	Metal Tripod	3
"	"	1276	Charles Rowley	Candle Wedge	3
June	1	1277	Samuel Eaton	Machine sweeping brush	3
"	2	1278	William Nunn	Stove-front	3
"	"	1279	Southwell and Co.	Carpet	1
"	"	1280	J. F. Empson	Button	3
"	3	1281	Thomas Humphries	Carpet	1
"	"	1282	Lea and Co.	Ditto	1
"	"	1283	W. H. Place	Rake	3
"	6	1284	Samuel Ackroyd	Stove	3
"	"	1285	C. and J. Field	Metal sustainers or supports for wax lights	3
"	"	1286	James Carpenter	Currycomb	3
"	"	1287	John Charles Dennis	Sextant limb	3
"	"	1288	Newcomb, Son, and Jones	Carpet	1
"	7	1289	Joseph Tonks	Hook and eye	3
"	"	1290,3	Matthew Mallon	Envelope	1
"	"	1294	Henry Cockey	Flue-door	3
"	"	1295,6	Morton and Co	Carpet	1
"	9	1297	Butcher, Worth and Holmes	Ditto	1
"	"	1298	Henry E. Hoole	Fender	3
"	"	1299	G. M. Braithwaite	Chimney cap	3
"	10	1300	Morton and Co.	Carpet	1
"	"	1301	Isaac Hellyer	Chimney cowl	3
"	13	1302	W. H. Phillips	Metal balance	3
"	"	1303	John Neill	Chimney-sweeping machine	3
"	14	1304	Spilsbury, Butler and Co.	Window blind	3
"	"	1305	J. C. Aston	Concave gas reflector	3
"	"	1306	D. L. Lewis	Piston for water-closet	3
"	"	1307	William Jeffery	Rope revolving grip for railway carriages	3
"	15	1308	Edward Perry	Waterford spittoon	3
"	"	1309	David Davies	Carriage-spring	3
"	"	1310	William Jeffery	Catch for rope grip	3
"	16	1311	George Kershaw	Micrometer balance	3
"	17	1312,13	G. Riddle	Money balance	3
"	"	1314	T. and W. F. Ross	Brush	1
"	20	1315	Lea and Co.	Carpet	1
"	"	1316	Henderson and Co.	Ditto	1
"	"	1317	Joseph S. Evans	Book writing-desk	1
"	"	1318	W. Marr	Scale and balance	3
"	21	1319	W. C. Wynn and Co.	Instrument for crushing and mashing	3
"	"	1320	Firman Fuller	Cattle tube	3
"	22	1321	J. Kitely	Carpet	1
"	"	1322	Howard and Co.	Princes cover	3

[AGENTS FOR EFFECTING REGISTRATIONS, MESSRS. ROBERTSON AND CO., 166, FLEET-STREET.]

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 28TH OF MAY, AND THE 23RD OF JUNE, 1842.

William Young, of Queen street, lamp-maker, for improvements in lamps and candlesticks. May 28; six months.

Philip Jacob Kayser, of Gracechurch-street, manufacturer, for improvements in the construction of lamps. May 31; six months.

Henry Phillips, of Exeter, chemist, for improvements in purifying gas for the purposes of light. May 31; six months.

Richard Watson, Jun., of Cloth-fair, gas fitter, for improvements in draining land embankments, and cutting of Railways and other engineering works. May 31; six months.

Henry Wilkinson, of Pall Mall, gun-maker, for improvements in unloading shipping, especially those vessels called colliers. May 31; six months.

Louis Nicholas de Meckenheim, of Vienna, but now of London, engineer, for improvements in the manufacture of iron. May 31; six months.

Henry Beaumont Leeson, of Greenwich, doctor of medicine, for improvements in the art of depositing and manufacturing metals and metal articles by electro-galvanic agency, and in the apparatus connected therewith. June 1; six months.

William Henry Kempton, of South street, Pentonville, gentleman, for improvements in the manufacture of candles. June 1; six months.

James Reed, of Bishop's Stortford, statuary and mason, for improvements in tiles, slating, and the construction of water-tight joints, and in the covering and casing of buildings and other erections. June 2; six months.

Henry Jubber, of Oxford, confectioner, for certain improvements in kitchen ranges, and apparatus for cooking. June 2; six months.

Benjamin Aingworth, of Birmingham, gentleman, for certain improvements in the manufacture of glass, for the purpose of producing glass which may be used for the purposes to which plate glass and window glass are usually applied. June 4; six months.

Edmund Tuck, of the Haymarket, St. James's, Westminster, silversmith, for certain improvements in the covering or plating with silver various metals and metallic alloys. June 4; six months.

William Irving, of Regent-street, Lambeth, engineer, for an improved corn drill, or machine for sowing all kind of seed or grain. June 7; six months.

John Woodcock, of Manchester, millwright, for certain improvements in the construction of steam-engines. June 7; six months.

James Nasmyth, of Patricroft, near Manchester, engineer, for certain improvements in machinery or apparatus for forging, stamping, and cutting iron and other substances. June 9; six months.

Joseph Chatwin, of Birmingham, lamp-maker, for certain improvements in the construction of cocks. June 9; six months.

John George Hughes, of No. 158, Strand, general agent, for a new application of telegraphic signals, and the mode of applying the same. June 9; six months.

James Anthony Emslie, of the Borough and County of Newcastle-upon-Tyne, civil engineer, for certain improvements in pumps. June 9; six months.

Stephen Bencraft, of Barnstaple, gentleman, for improvements in the construction of saddle-trees. June 9; six months.

Arthur Howe Holdsworth, of Brook-hill, Devon, gentleman, for improvements in constructing certain parts of ships and vessels in order to arrest the progress of fire, and for regulating temperature. June 11; six months.

Richard Garrett, of Leiston Works, Suffolk, agricultural instrument maker, for improvements in the construction of horse-hoes, scarifiers, drag-rakes, and drills, for cultivating land. June 13; six months.

Thomas Banks, of Manchester, engineer, for certain improvements in the construction of wheels and tyres of wheels, to be employed upon railways. June 13; six months.

Moses Poole, of Lincoln's-inn, gentleman, for improvements in obtaining the colouring matter from wool, and woollens dyed with indigo. (Being a communication.) June 13; six months.

William Cotton, of Leytonstone, Essex, Esquire, for an improved weighing machine. June 13; two months.

Daniel Williams, of Oxford, Slater, for improvements in covering ridges and hips on the roofs of buildings. June 13; six months.

Isaac Moss, of Macclesfield, Cheshire, silk trimming manufacturer, for improvements in the manufacture of covered buttons, ornaments and fastenings for wearing apparel. June 13; six months.

William Morrett Williams, of Bedford-place, Commercial-road, and of 163, Fenchurch-street, lock manufacturer, for certain improvements in the construction of locks and keys, which he proposes to call "Williams' Lock and Key improved." June 13; six months.

Henry Hough Watson, of Bolton-le-Moors, consulting chemist, for certain improvements in bleaching, changing the colour of, and otherwise preparing, purifying and refining tallow, and certain other organic substances, mixtures, compounds, and manufactures. June 21; six months.

Joseph Bunnett, of Deptford, Kent, engineer, for certain improvements in pavements, for streets, roads and other surfaces, and in machinery for producing and repairing the same. June 21; six months.

John Dickson, of Brook-street, Holborn, engineer, for improvements in rotary engines and boilers, in stopping railway carriages, and in machinery for propelling vessels, part of which improvements are applicable to propelling air and gases. June 21; six months.

Frederick Gye, jun., of South Lambeth, gent. for improvements in binding pamphlets, papers and other documents. June 21; six months.

Thomas Gaunt, of 10, Dalby Terrace, City Road, gent., for improvements in the means of applying any such power as is, or may be used for propelling vessels or carriages to produce locomotion thereof. June 21; six months.

Henry Bewley, of Dublin, licentiate apothecary and chemist, for an improved chalybeate water. June 23; six months.

Application of Voltaic Precipitation to the detection of minute portions of Arsenic.—In the course of a recent lecture at the Medico Botanical Society, by Dr. Sigmund, on mineral and vegetable poisons, the professor exhibited a process lately proposed by Captain Powell for the detection of minute portions of arsenic, by passing a current of electricity through the solution suspected of containing it. The experiment showed that if to a liquid in which arsenic is suspected to be present, potass is added, and then submitted to voltaic action, arsenic will be deposited on one side, on a plate of copper inserted to receive it, and the potass on the other. Dr. S. observed that the idea was not altogether new, for Dr. Paris, some years back, proposed a somewhat similar test for mercury, and Sir Humphrey Davy had applied it to other metals. Dr. Sigmund then proceeded to show the superiority of this test over those used by Orfila, in Madame Laffarge's case, which depended upon the impossibility of there being those adulterations in the means employed, which had been more than suspected to exist on that occasion.

END OF THE THIRTY-SIXTH VOLUME.

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